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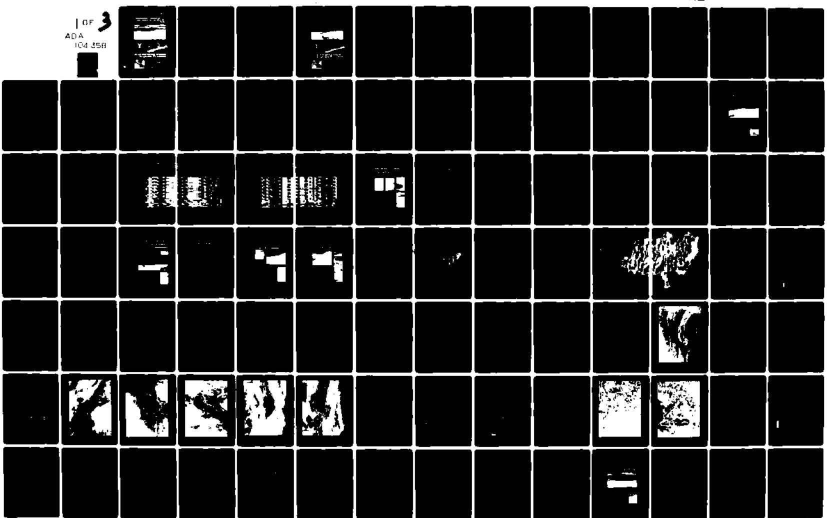

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Environmental Consequences to the Study Regions and Operating Base Vicinities

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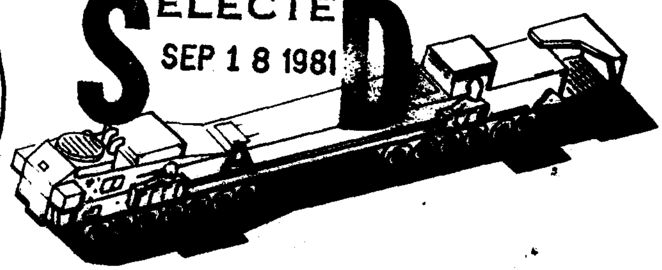

Environmental Impact Analysis Process

DEPLOYMENT AREA SELECTION AND LAND WITHDRAWAL/ ACQUISITION DEIS

DEPARTMENT OF THE AIR FORCE

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The resources which are analyzed in this chapter were identified on the basis of (a) scoping meetings which the Air Force conducted with state and federal agencies and the public and (b) a professional interdisciplinary review of the ten general environmental issues which had been identified. These issues are:

Rapid, large scale growth
land use/land rights
water resources (con't)

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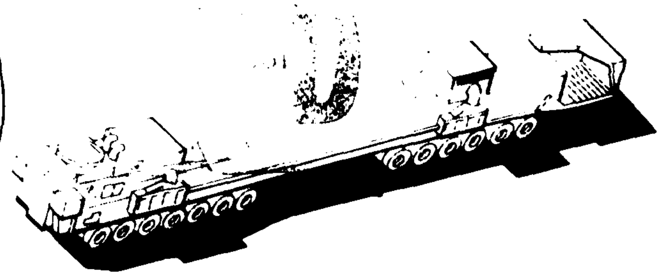
public health
archaeological and historical resources
energy and nonrenewable resources
terrestrial and aquatic biology
air quality
Native Americans
construction resources

These issues, which are organized under the two major headings Natural Envirommment and Human Environment, were then subdivided into resource categories for analsis.

IV

Part I

Environmental Consequences to the Study Regions and Operating Base Vicinities



Environmental Impact Analysis Process

DEPLOYMENT AREA SELECTION AND LAND WITHDRAWAL/ ACQUISITION DEIS

DEPARTMENT OF THE AIR FORCE

DEPLOYMENT AREA SELECTION
AND
LAND WITHDRAWAL/ACQUISITION DEIS

CHAPTER 1: PROGRAM OVERVIEW

CHAPTER 1 PRESENTS AN OVERVIEW OF THE M-X SYSTEM AND THIS EIS INCLUDING:

- A DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES, INCLUDING SCHEDULE AND RESOURCE REQUIREMENTS
- AN OVERVIEW OF THE TIERED M-X ENVIRONMENTAL PROGRAM THAT INVOLVES SITE SELECTION AND LAND WITHDRAWAL
- A PRESENTATION OF PUBLIC SAFETY CONSIDERATIONS WITH PHYSICAL SECURITY AND SYSTEM HAZARDS
- A SUMMARY OF FEDERAL AND STATE AUTHORIZING ACTIONS ASSOCIATED WITH CONSTRUCTION AND OPERATIONS

CHAPTER 2: COMPARATIVE ANALYSIS OF ALTERNATIVES

CHAPTER 2 COMPARES THE ENVIRONMENTAL IMPACTS OF ALTERNATIVE M-X SYSTEM AND OPERATING BASE COMBINATIONS. DETAILS INCLUDE:

- THE SELECTION OF LOCATIONS FOR TWO SUITABLE DEPLOYMENT REGIONS, 200 CLUSTERS, AND SEVEN ALTERNATIVE OPERATING BASES
- PRESENTATION OF CONCEPTUAL CONSTRUCTION SCHEDULES, PERSONNEL REQUIREMENTS, AND RESOURCE NEEDS FOR EACH ALTERNATIVE
- COMPARATIVE ENVIRONMENTAL ANALYSIS BY ALTERNATIVE FOR EACH RESOURCE PRESENTED IN CHAPTERS 3 AND 4

CHAPTER 3: AFFECTED ENVIRONMENT

CHAPTER 3 DESCRIBES THE POTENTIALLY AFFECTED ENVIRONMENT IN NEVADA, UTAH, TEXAS, AND NEW MEXICO. ENVIRONMENTAL FEATURES OF BOTH BI-STATE REGIONS AND OF OPERATING BASE VICINITIES ARE PRESENTED. RESOURCES ADDRESSED INCLUDE:

- WATER, AIR, MINING, VEGETATION, AND SOILS
- WILDLIFE, AQUATIC SPECIES, AND PROTECTED PLANT AND ANIMAL SPECIES
- EMPLOYMENT, POPULATION, PUBLIC FINANCE, TRANSPORTATION, CONSTRUCTION RESOURCES, ENERGY, LAND USE, AND RECREATION
- CULTURAL RESOURCES, NATIVE AMERICAN CONCERNS, ARCHAEOLOGICAL AND HISTORIC FEATURES

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES TO THE STUDY REGIONS AND OPERATING BASE VICINITIES

CHAPTER 4 EXPANDS THE CHAPTER 2 ANALYSIS FOR EACH RESOURCE IN CHAPTER 3. ADDRESSING THE QUESTIONS RAISED IN SCOPING, CHAPTER 4 DISCUSSES THE FOLLOWING TOPICS ON A RESOURCE BY RESOURCE BASIS.

- THE REASON EACH RESOURCE IS IMPORTANT AND THE SOURCE OF SIGNIFICANT DIRECT AND INDIRECT IMPACTS
- THE INTERRELATIONSHIPS BETWEEN RESOURCES AND KEY CAUSES OF SHORT- AND LONG-TERM IMPACTS SUCH AS AREA DISTURBED AND POPULATION GROWTH
- MITIGATIVE MEASURES WHICH POTENTIALLY REDUCE IMPACTS
- A MATRIX OF POTENTIAL IMPACT SEVERITY BY GEOGRAPHIC AREA FOR THE PROPOSED ACTION AND EACH ALTERNATIVE

CHAPTER 5: APPENDICES

CHAPTER 5 CONTAINS AN M-X BASING ANALYSIS REPORT WITH APPLICATION OF SELECTION CRITERIA TO CANDIDATE BASING AREAS. ADDITIONAL SECTIONS INCLUDE:

GLOSSARY	BIBLIOGRAPHIC NOTE
ACRONYMS	REFERENCES
LIST OF PREPARERS	INDEX
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Comparative Analysis of Alternatives

COMPARATIVE ANALYSIS OF ALTERNATIVES

4.1 INTRODUCTION

The resources which are analyzed in this chapter were identified on the basis of (a) scoping meetings which the Air Force conducted with state and federal agencies and the public and (b) a professional interdisciplinary review of the ten general environmental issues which had been identified. These issues are:

rapid, large-scale growth
land use/land rights
water resources
public health
archaeological and historical resources
energy and nonrenewable resources
terrestrial and aquatic biology
air quality
Native Americans
construction resources

These issues, which are organized under the two major headings Natural Environment and Human Environment, were then subdivided into resource categories for analysis (see Table 4.1-1).

Chapter 4 forms the scientific and analytic basis for the comparison of environmental consequences sumamrized in Chapter 2. Additional support can be found in the Environmental Technical Reports (ETRs). These reports are not necessary to review and evaluate the EIS but do provide additional supporting detail of concern to specialists in various disciplines. Section 4.2 presents a very brief summary description of the proposed action and alternatives (see Chapter 2, Section 2.2 for a more detailed description).

Section 4.3 provides a detailed examination resource-by-resource of the significant resources which are expected to be significantly impacted by the Proposed Action or any of the alternatives. Table 4.1-1 summarizes these resources in the order in which they are presented. Each discussion includes the following:

Table 4.1-1. Resource categories and resources discussed in Section 4.3.1.

I. NATURAL ENVIRONMENT	
RESOURCE	RESOURCE CATEGORY
Water resources	Groundwater Surface water
Air resources	Air quality
Mining and geology	
Vegetation	Native vegetation
Wildlife	Pronghorn antelope Sage grouse Bighorn sheep
Protected species	Desert tortoise Utah prairie dog Rare plants Aquatic species
Wilderness	
II. HUMAN ENVIRONMENT	
Economy	Employment and labor force Income and earnings
Population	
Housing	
Public finance	
Community infrastructure	Educational services Health services personnel Public safety personnel Urban land use
Quality of life	
Transportation	
Energy	
Land	Land ownership Irrigated cropland Ranches and homes Grazing Recreation
Native Americans	Cultural resources Land use and water accessibility Migration
Archaeological and historical resources	
Paleontological resources	
Construction resources	

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unavoidable adverse impacts of the project, the relationship between the short-term uses of man's environment and the long-term productivity, cumulative impacts when other regional projects are considered, and the irreversible or irretrievable commitments of resources. The impact analysis includes direct and indirect impacts, differentiates between impacts associated with construction and operations phases, and support measures for mitigative adverse impacts. For each resource, the potential for impact is assessed for conceptual layouts of full and split deployment in Nevada/Utah and Texas/New Mexico for DDAs for OBs.

Analysis of the resources includes maps which illustrate the relationship between project activity and resource distribution for the DDAs and OB sites suitability areas and vicinity. Where applicable, tables which summarize resource abundance and significance of impact by hydrological subunits for the Nevada/Utah DDA and OBs by county for the Texas/New Mexico DDA and OBs are also included. Comparisons of the short- and long-term impacts on the resource of the Proposed Action and alternatives are also graphically summarized. Figure 4.1-1 presents an overall summary of the short-term impacts presented in Section 4.3. Figure 4.1-2 summarizes the long-term impacts.

Section 4.4 adds significant resources from the natural environment which were not found to be significantly impacted by the Proposed Action and alternatives. For example, an analysis of the relationship between project activity and the distribution of mule deer, waterfowl and a variety of small game birds indicated that these resources would not be significantly impacted. Nevertheless, a discussion of those analyses and findings are included in Section 4.4.

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Fig 4.1-1 SUMMARY COMPARISON OF S
BETWEEN THE PROPOSED AC

ACTION		GROUNDWATER AVAILABILITY	SURFACE WATER (ERROSION)	AIR QUALITY	MINING CLAIMS	NATIVE VEGETATION	PRONGHORN ANTELOPE	SAGE GROUSE	BIGHORN SHEEP	DESERT TORTOISE	UTAH PRAIRIE DOG	RARE PLANTS	AQUATIC SPECIES	WILDERNESS	EMPLOYMENT & LABOR FORCE	EARNINGS	POPULATION	HOUSING	PU
		NATURAL ENVIRONMENT RESOURCE																	
PROPOSED ACTION (PA)	DDA (NEVADA/UTAH)																		
	1-OB (COYOTE SPRING/CLARK CO.)																		
	2-OB (MILFORD/BEAVER CO.)																		
ALT 1	DDA (NEVADA/UTAH)																		
	1-OB (COYOTE SPRING/CLARK CO.)																		
	2-OB (BERYL/IRON CO.)																		
ALT 2	DDA (NEVADA/UTAH)																		
	1-OB (COYOTE SPRING/CLARK CO.)																		
	2-OB (DELTA/MILLARD CO.)																		
ALT 3	DDA (NEVADA/UTAH)																		
	1-OB (BERYL/IRON CO.)																		
	2-OB (ELY/WHITE PINE CO.)																		
ALT 4	DDA (NEVADA/UTAH)																		
	1-OB (BERYL/IRON CO.)																		
	2-OB (COYOTE SPRING/CLARK CO.)																		
ALT 5	DDA (NEVADA/UTAH)																		
	1-OB (MILFORD/BEAVER CO.)																		
	2-OB (ELY/WHITE PINE CO.)																		
ALT 6	DDA (NEVADA/UTAH)																		
	1-OB (MILFORD/BEAVER CO.)																		
	2-(COYOTE SPRING/CLARK CO.)																		
ALT 7	DDA (TEXAS/NEW MEXICO)																		
	1-OB (CLOVIS/CURRY CO.)																		
	2-OB (DALHART/HARTLY CO.)[1]																		
ALT 8	DDA (NEVADA/UTAH)																		
	DDA (TEXAS/NEW MEXICO)																		
	1-OB (COYOTE SPRING/CLARK CO.)																		
	2-OB (CLOVIS/CURRY CO.)																		

1 WHILE THERE MAY BE AN OVERALL ESTIMATE OF NO IMPACT OR LOW IMPACT WHEN CONSIDERING THE DDA REGION AS A WHOLE, IT MUST BE RECOGNIZED THAT DURING SHORT TERM CONSTRUCTION ACTIVITIES, SPECIFIC AREAS OR COMMUNITIES WITHIN OR NEAR THE DDA COULD BE SIGNIFICANTLY IMPACTED. THESE LOCAL IMPACTS ARE ANALYZED ON A HYDROLOGICAL SUBUNIT OR COUNTY BASIS IN CHAPTER 4.

2 THE REDUCTION IN DDA SIZE FOR NEVADA/UTAH UNDER ALTERNATIVE 8 DOES NOT NECESSARILY CHANGE THE SIGNIFICANCE OF IMPACT ON A SPECIFIC RESOURCE. MANY IMPACTS OCCUR IN A LIMITED GEOGRAPHIC AREA WHICH IS INCLUDED IN BOTH THE FULL AND SPLIT DEPLOYMENT DDAs, OR ARE SPECIFIC TO THE OB SUITABILITY ZONE.

ARY COMPARISON OF SHORT-TERM IMPACT SIGNIFICANCE

EEN THE PROPOSED ACTION AND ALTERNATIVES[1,2]

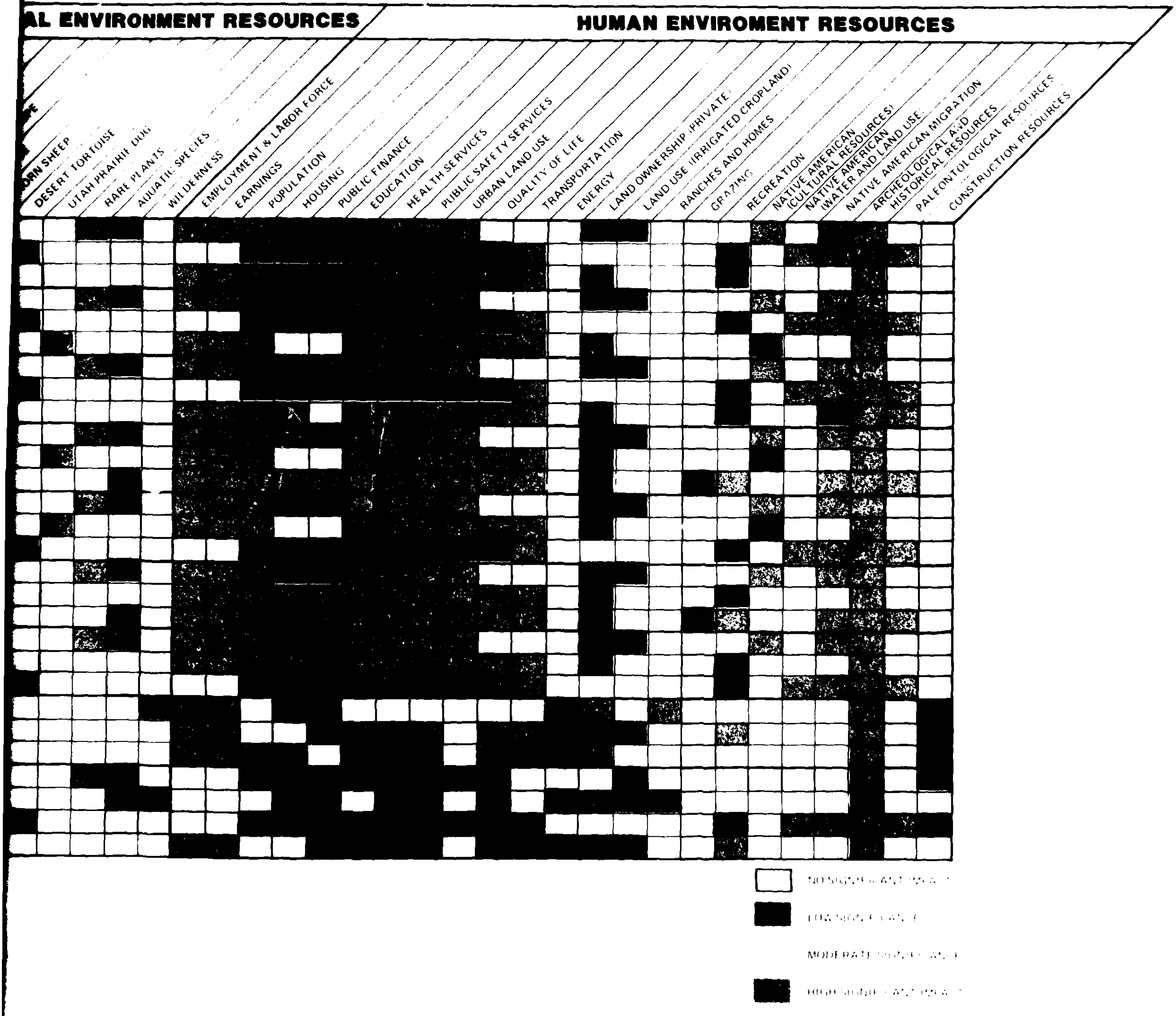

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Fig 4.1-2 SUMMARY COMPARISON OF LON
BETWEEN THE PROPOSED ACTIO

ACTION		NATURAL ENVIRONMENT RESOURCES																		
		GROUNDWATER AVAILABILITY	SURFACE WATER (ERROSION)	AIR QUALITY	MINING CLAIMS	NATIVE VEGETATION	PRONGHORN ANTELOPE	SAGE GROUSE	BIGHORN SHEEP	DESERT TORTOISE	UTAH PRAIRIE DOG	RARE PLANTS	AQUATIC SPECIES	WILDERNESS	EMPLOYMENT & LABOR FORCE	EARNINGS	POPULATION	HOUSING	PUBLIC FIN	EDU
PROPOSED ACTION (PA)	DDA (NEVADA/UTAH)																			
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ALT 3	DDA (NEVADA/UTAH)																			
	1-OB (BERYL/IRON CO.)																			
	2-OB (ELY/WHITE PINE CO.)																			
ALT 4	DDA (NEVADA/UTAH)																			
	1-OB (BERYL/IRON CO.)																			
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ALT 5	DDA (NEVADA/UTAH)																			
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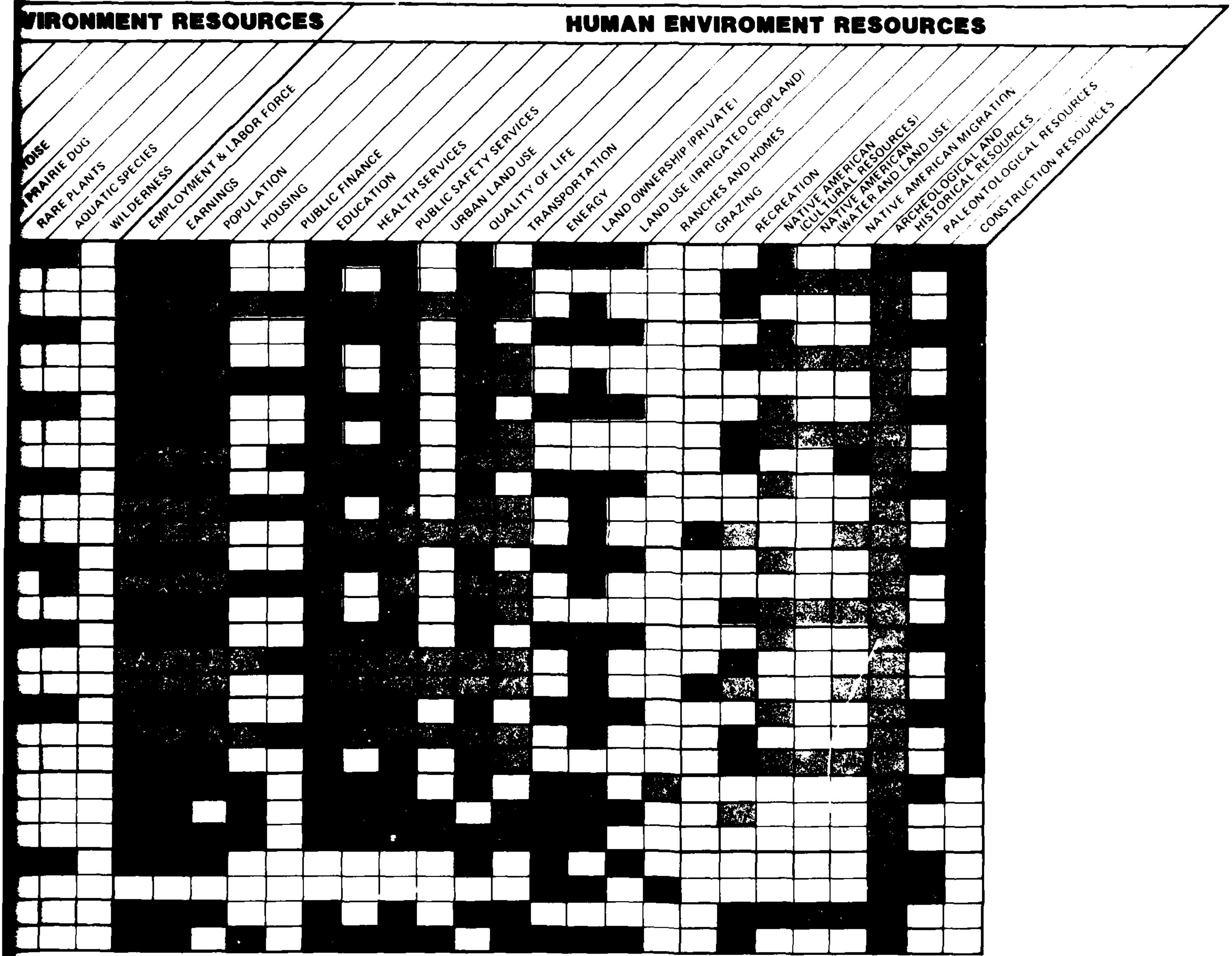
COMPARISON OF LONG TERM IMPACT SIGNIFICANCE

THE PROPOSED ACTION AND ALTERNATIVES[1,2]



NO SIGNIFICANT IMPACT

LOW SIGNIFICANCE

MODERATE SIGNIFICANCE

HIGH SIGNIFICANT IMPACT

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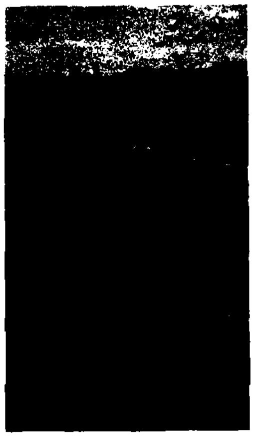
Description of Proposed Action and Alternatives




DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This section briefly sumarizes the description of the Proposed Action and alternatives presented in Section 2.2. Additional details regarding the size, location, and timing of construction are presented in Section 2.2. This abbreviated description is included so that readers of Chapter 4 will have rapid access to important project elements while reading the discussions of potential environmental impacts presented in Sections 4.3 and 4.4. Discussion of the No Action Alternative, presented in Section 2.2.5, identifies trends within deployment areas and evaluates the regional environmental ramifications of a no deployment decision at this time.

The Proposed Action is full basing (200 missiles) deployment in Nevada/Utah, with the first OB complex in Coyote Spring Valley, Nevada and the second near Milford, Utah. Alternatives 1 through 6 use the same DDA layout and the additional OB complex locations of Beryl and Delta, Utah and Ely, Nevada. Alternative 7, full basing in Texas/New Mexico, has OB compexes near Clovis, New Mexico and Dalhart, Texas. Alternative 8 splits the system: 100 missiles in Nevada/Utah, and 100 missiles in Texas/New Mexico, a first OB complex at Coyote Spring Valley, and a second OB complex near Clovis. The alternatives to the Proposed Action are numbered to facilitate discussion of them. Their numerical order is not hierarchical and does not indicate preference.

Table 4.2-1 shows the OB complex locations and components for the Proposed Action and alternatives. Table 4.2-2 shows the distribution of protective shelters by state and county for the Proposed Action and the alternatives. Permanent and temporary land requirements are shown in Table 4.2-3. For the Proposed Action and Alternatives 1 through 7 the total fenced area is 25 square nautical miles (sq nm). For Alternative 8 the total fenced area is about 28 sq nm.

Estimated construction resources for full Nevada/Utah deployment, the Proposed Action, and Alternatives 1 through 6, are shown in Table 4.2-4. Generally, the peak year requirement for most materials occurs in 1987. The personnel are average direct construction workers only. No water for revegetation was included. The disturbed area includes OB complex, protective shelter, and road construction; but does not include temporary construction facilities, such as marshalling yards, water wells, aggregate pits, etc. Reinforcing steel and steel shapes comprise the steel quantities. Aggregate is for road construction only.

Table 4.2-1. OB complex locations and components for Proposed Action and alternatives.

ALTERNATIVE	FIRST OB COMPLEX		SECOND OB COMPLEX	
	LOCATION	SYSTEM COMPONENTS	LOCATION	SYSTEM COMPONENTS
Proposed Action	Coyote Spring Valley, Nevada	OB, DAA, OBTS, Airfield	Milford, Utah	OB, Airfield
1.	Coyote Spring Valley, Nevada	OB, DAA, OBTS, Airfield	Beryl, Utah	OB, Airfield
2.	Coyote Spring Valley, Nevada	OB, DAA, OBTS, Airfield	Delta, Utah	OB, Airfield
3.	Beryl, Utah	OB, DAA, OBTS, Airfield	Ely, Nevada	OB, Airfield
4.	Beryl, Utah	OB, DAA, OBTS, Airfield	Coyote Spring Valley, Nevada	OB, Airfield
5.	Milford, Utah	OB, DAA, OBTS, Airfield	Ely, Nevada	OB, Airfield
6.	Milford, Utah	OB, DAA, OBTS, Airfield	Coyote Spring Valley, Nevada	OB, Airfield
7.	Clovis, New Mexico	OB, DAA, OBTS, Airfield	Dalhart, Texas	OB, Airfield
8.	Coyote Spring Valley, Nevada	OB, DAA, OBTS Airfield	Clovis, New Mexico	OB, DAA, Airfield
No Action	—	—	—	—

3601-2

Table 4.2-2. Distribution of protective shelters by state and county for the Proposed Action (PA) and alternatives.

STATE/COUNTY	ALTERNATIVE		
	PA, 1-6	7	8
Nevada			
Esmeralda	138	—	—
Eureka	323	—	—
Lander	84	—	—
Lincoln	953	—	920
Nye	1,324	—	629
White Pine	437	—	36
Subtotal	3,259	—	1,585
Utah			
Beaver	189	—	188
Juab	314	—	17
Millard	754	—	510
Tooele	84	—	—
Subtotal	1,341	—	715
Region Total	4,600	—	2,300
Texas			
Bailey	—	126	14
Castro	—	137	—
Cochran	—	61	51
Dallam	—	690	190
Deaf Smith	—	574	242
Hartley	—	354	250
Hockley	—	16	14
Lamb	—	42	9
Oldham	—	74	41
Parmer	—	246	1
Randall	—	55	—
Sherman	—	39	—
Swisher	—	26	—
Subtotal	—	2,440	812
New Mexico			
Chaves	—	481	474
Curry	—	196	43
De Baca	—	137	115
Guadalupe	—	6	6
Harding	—	215	202
Lea	—	16	17
Quay	—	342	312
Roosevelt	—	542	164
Union	—	225	155
Subtotal	—	2,160	1,488
Region Total	—	4,600	2,300
TOTAL	4,600	4,600	4,600

2604- 5

Table 4.2-3. M-X system facilities land requirements (acres).

DESCRIPTION	NUMBER	CONSTRUCTION	OPERATIONS	
			FENCED[1]	TOTAL
Operating Base Complexes				
First OB	1	6,140	3,740	6,140
Second OB	1[2]	4,240-6,140	2,740-3,740	4,240-6,140
OBTS	1	250	30	90
DAA	1-2[2]	1,950-3,900	1,950-3,900	1,950-3,900
Subtotal		12,580-16,430	8,460-11,410	12,420-16,270
DDA Facilities				
Shelters	4,600	34,500	11,500	11,500
DTN	1,260-1,460[3]	15,300-17,700	na	11,500-13,300
Cluster Road	5,900-6,200[3]	72,000-75,200	na	54,000-56,400
Support Road	1,320[3]	8,100	na	8,100
CMF	200	1,040	800	800
Antenna	4,600	850	na	850
ASC	3-4	165-220	60-80	165-220
RSS	200	70	50	50
Construction Camps	15-18	375-450	na	na
Concrete Plants	100-200	500-1,000	na	na
Material Source Points	15-18	150-180	na	na
Water Wells	150-310	150-310	na	na
Marshalling Yards	3-5	1,950-3,250	na	na
Construction Roads	250-350[3]	3,000-4,200	na	na
Subtotal		138,150-147,070	12,410-12,430	86,965-91,220
Total		150,700-163,500	20,900-23,900	99,400-107,500

3666-3

[1]20,900 acres = 24.7 sq.nm. (Proposed Action and Alternatives 1 thru 7).

[2]High end of range reflects split basing (Alternative 8).

[3]Statute Miles

Table 4.2-4. Total construction resources for Proposed Action, Nevada/Utah full basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]	1,150	1,992	4,400	10,722	17,075	15,303	13,017	4,821
Water (AF)								
Incremental	380	890	6,133	18,376	20,669	23,075	14,295	3,207
Cumulative	380	1,270	7,403	25,779	46,448	69,523	83,818	87,025
Disturbed Area (Acres)								
Incremental	1,740	3,317	10,907	26,566	32,631	36,461	22,926	5,484
cumulative	1,740	5,057	15,964	42,530	75,161	111,622	134,548	140,032
Materials								
Steel (TNS)								
Incremental		850	3,539	30,112	121,399	82,982	107,242	50,068
Cumulative		850	4,389	34,501	155,900	238,882	346,124	396,192
Concrete (CY*1,000)								
Incremental		150	189	365	1,094	794	924	436
Cumulative		150	339	704	1,798	2,592	3,516	3,952
Asphalt (TNS*1,000)								
Incremental		121	1,491	1,836	1,979	2,035	397	100
Cumulative		121	1,612	3,448	5,427	7,462	7,859	7,959
Aggregate (CY*1,000)								
Incremental	140	363	3,659	11,921	10,395	13,630	6,988	649
Cumulative	140	503	4,162	16,083	26,478	40,108	47,096	47,745
Prime Coat (TNS)								
Incremental		444	6,725	7,816	7,898	8,864	2,438	850
Cumulative		444	7,169	14,985	22,883	31,747	34,185	35,035
Fencing (LF*1,000)								
Incremental			45	505	1,938	1,308	1,727	807
Cumulative			45	550	2,488	3,796	5,523	6,330

[1]Personnel numbers are yearly averages.

3315-3

Estimated construction resources for full Texas/New Mexico deployment, Alternative 7, are included in Table 4.2-5. The corresponding estimates for split basing, Alternative 8, are presented for Nevada/Utah in Table 4.2-6 and for Texas/New Mexico in Table 4.2-7. These project elements and construction resource requirements have been compared with the description of the deployment regions presented in Chapter 3 to produce the potential impacts presented in Chapter 4.

Table 4.2-5. Total construction resources for Alternative 7, Texas/New Mexico full basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]	1,150	2,834	4,981	10,278	14,414	15,874	13,102	4,259
Water (AF)								
Incremental	380	3,217	5,922	15,554	20,494	21,225	13,636	2,503
Cumulative	380	3,597	9,519	23,073	45,567	66,792	80,428	82,931
Disturbed Area (Acres)								
Incremental	1,740	6,444	11,171	22,110	32,030	34,483	22,208	4,311
cumulative	1,740	8,184	19,355	41,465	73,495	107,978	130,186	134,497
Materials								
Steel (TNS)								
Incremental		850	12,163	45,362	76,287	103,797	112,592	45,139
Cumulative		850	13,013	58,375	134,662	238,459	351,051	396,190
Concrete (CY*1,000)								
Incremental		150	252	477	763	947	963	400
Cumulative		150	402	879	1,642	2,589	3,552	3,952
Asphalt (TNS*1,000)								
Incremental		657	968	2,443	1,198	1,508	170	100
Cumulative		657	1,625	4,068	5,266	6,774	6,944	7,044
Aggregate (CY*1,000)								
Incremental	140	1,863	3,483	8,910	12,210	11,781	6,421	277
Cumulative	140	2,003	5,486	14,396	26,606	38,387	44,808	45,085
Prime Coat (TNS)								
Incremental		2,403	4,414	10,032	5,041	6,936	1,610	850
Cumulative		2,403	7,217	17,249	22,290	29,226	30,836	31,686
Fencing (LF*1,000)								
Incremental			183	748	1,221	1,640	1,812	729
Cumulative			183	931	2,152	3,792	5,604	6,333

[1]Personnel numbers are yearly averages.

3316-3

Table 4.2-6. Total construction resources for portion of Alternative 8, Nevada/Utah split basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]	1,100	1,971	4,314	8,274	7,993	6,323	4,450	1,208
Water (AF)								
Incremental	360	947	5,696	11,672	10,346	8,671	5,387	704
Cumulative	360	1,307	7,003	18,675	29,021	37,692	43,079	43,783
Disturbed Area (Acres)								
Incremental	1,670	3,339	10,513	16,687	15,528	14,057	8,934	1,399
cumulative	1,670	5,009	15,522	32,209	47,737	61,794	70,728	72,127
Materials								
Steel (TNS)								
Incremental		820	3,086	36,327	51,265	50,972	40,443	15,586
Cumulative		820	3,906	40,233	91,498	142,470	182,913	198,769
Concrete (CY*1,000)								
Incremental		140	195	410	463	374	297	116
Cumulative		140	335	745	1,208	1,582	1,879	1,995
Asphalt (TNS*1,000)								
Incremental		160	1,233	1,217	1,004	256	132	
Cumulative		160	1,393	2,610	3,614	3,870	4,002	
Aggregate (CY*1,000)								
Incremental	130	388	3,450	6,924	5,588	4,784	2,686	
Cumulative	130	518	3,968	10,892	16,480	21,264	23,950	
Prime Coat (TNS)								
Incremental		587	5,733	5,521	4,315	935	488	
Cumulative		587	6,320	11,841	16,156	17,091	17,579	
Fencing (LF*1,000)								
Incremental			37	604	831	811	643	254
Cumulative			37	641	1,472	2,283	2,926	3,180

[1]Personnel numbers are yearly averages.

3318-2

Table 4.2-7. Total construction resources for portion of Alternative 8, Texas/New Mexico split basing.

CONSTRUCTION RESOURCES	QUANTITY PER YEAR							
	1982	1983	1984	1985	1986	1987	1988	1989
Personnel[1]		300	1 933	4,326	8,711	9,294	6.811	2,658
Water (AF)								
Incremental		110	885	5,748	12.701	11,546	8.984	1,782
Cumulative		110	995	6.743	19.444	30,990	39.974	41.756
Disturbed Area (Acres)								
Incremental		570	3.607	10.913	18,157	17,993	14.625	3.402
cumulative		570	4,177	15,090	33,247	51,240	65.865	69,267
Materials								
Steel (TNS)								
Incremental			740	3,315	38,188	65,561	57,278	33.369
Cumulative			740	4,055	42,243	107.804	165,082	198.451
Concrete (CY*1,000)								
Incremental			140	197	424	568	420	245
Cumulative			140	337	761	1,329	1.749	1.994
Asphalt (TNS*1,000)								
Incremental			110	1.309	1.333	546	304	
Cumulative			110	1,419	2.752	3.298	3.602	
Aggregate (CY*1,000)								
Incremental		40	359	3,429	7,582	6,257	4,783	231
Cumulative		40	399	3,828	11,410	17.667	22,450	22,681
Prime Coat (TNS)								
Incremental			403	6,073	5,947	2,580	1,113	
Cumulative			403	6,476	12,423	15,003	16,116	
Fencing (LF*1,000)								
Incremental				38	635	1.058	911	531
Cumulative				38	673	1,731	2,642	3,173

[1]Personnel numbers are yearly averages.

3324-3

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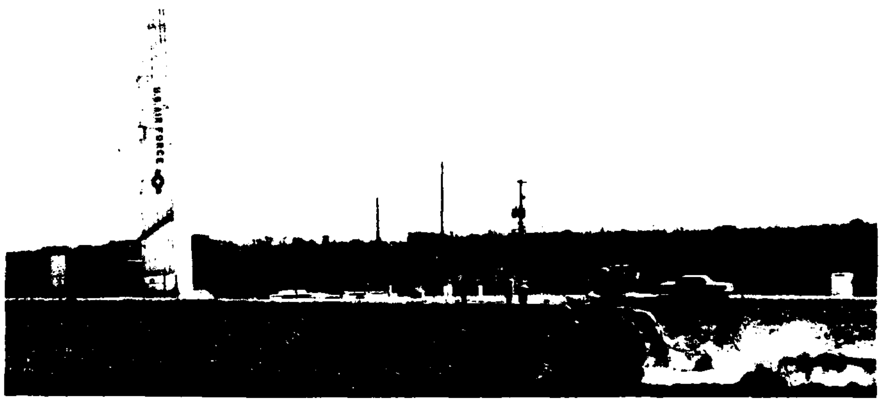
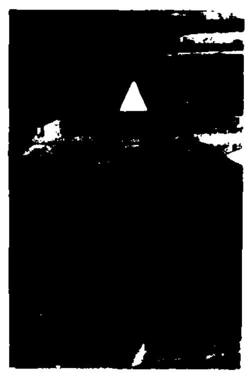
Comparative Analysis of Environmental Consequences

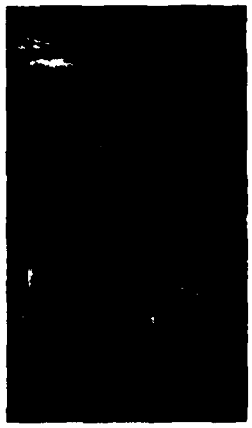




COMPARATIVE ANALYSIS OF ENVIRONMENTAL CONSEQUENCES

This section provides for each significant natural and human resource an analysis of the relative impacts anticipated for the Proposed Action and alternatives 1 through 8. The resources addressed here are the significant resources having potentially significant impacts; these analyses are summarized in Chapter 2. Section 4.4 covers the impact analyses performed for other resources for which project effects are expected to be minimal, because of either the relative resource abundance or the lack of meaningful intersection with the project.

Natural Environment



Water Resources

GROUNDWATER

INTRODUCTION (4.3.1.1.1)

Successful implementation of the M-X project will require significant development of water resources to meet both the relatively short-term (2-5 years at any location) construction needs and the longer-term (about 30 years) system operation and support facility needs. Water is a scarce resource in the large regions of the southwestern United States being considered for M-X deployment. Changes in the availability of water could effect many sectors of life in these regions. Thus, water must be considered a significant resource.

In order to assess water availability, an M-X Water Resources program was initiated in June 1979 for both the construction and operational phases of the M-X project. The groundwater studies program status and scope are shown in Figure 4.3.1.1-1.

The most significant potential impact of M-X water development on groundwater resources is its possible effect on groundwater availability for competing water users. The possible lowering of water levels in existing wells could be a short- or long-term problem affecting groundwater availability through increased pumping costs, or, in the most severe case, the need to deepen existing wells. Other impacts which could result from hydraulic responses to M-X withdrawals include reduced spring flow, reduction of regional groundwater flow, deterioration of water quality and land subsidence.

A reduction of spring flow could result from a lowering of pressure (or head) in the spring's source aquifer(s). If the spring flow is currently diverted for beneficial use, then the user(s) would be immediately impacted. Unlike the well user who could still pump from a well with a lowered water level, the spring user(s) would have no immediate method available for retrieving the water lost. Corresponding secondary socioeconomic impacts may be felt in areas which depend on springs potentially affected by the M-X-related water use.

Reduced spring flows may also lead to a disruption or destruction of wetland habitats and areas of phreatophyte vegetation. From purely a water management

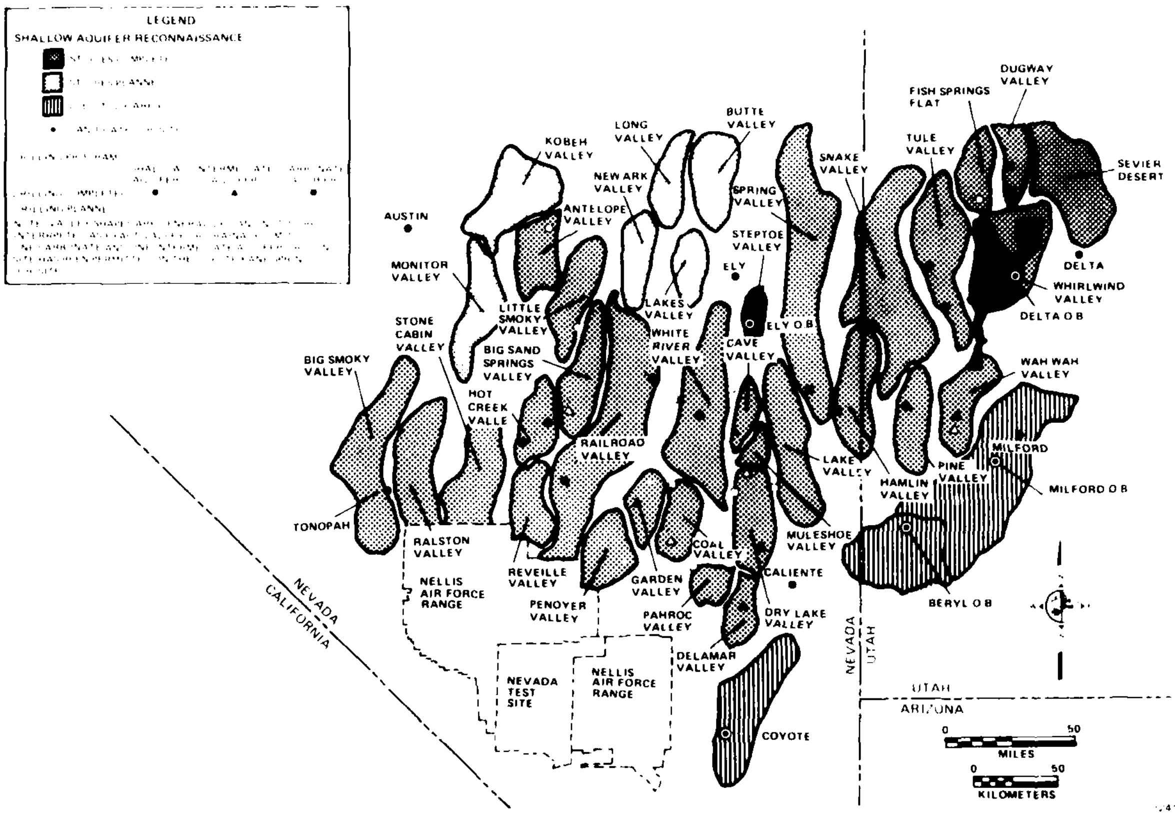


Figure 4.3.1.1-1. Groundwater studies program status and scope.

point of view, a project which derives water largely from intercepted natural groundwater discharge is viewed with favor because water that was formerly being lost or "wasted" to evapotranspiration is being diverted and put to beneficial use. In many areas, however, natural groundwater discharge does maintain an important habitat for native plants and wildlife. Interception or disruption of that discharge may lead to biological impacts in that community. In confined aquifers, interception of natural discharge may occur relatively quickly as the pressure effects of pumping can be transmitted over large distances within the flow system in relatively short periods of time. In unconfined aquifers, considerable volumes of water usually must be removed from aquifer storage before a spring or natural discharge is disrupted.

Regional flows could be impacted by additional groundwater development. Reduction of the regional flows could result in reduced spring flows, the impacts of which have been discussed.

Water quality could be adversely impacted if M-X withdrawals result, for example, in dewatering of fine-grained sediments, or in significant volumes of water being removed from aquifer storage. Water uses sensitive to changes in water quality include domestic, industrial and to a lesser extent, irrigation uses. Natural resources which are sensitive to changes in water quality include aquatic species and native vegetation. In areas where existing water quality is already a limiting factor, further deterioration in water quality could render the source unfit for certain uses.

Land subsidence resulting from the withdrawal of groundwater is generally most severe in areas close to well fields and can be a serious problem, particularly if well fields are located in inhabited areas where damage to buried pipes, building foundations, or other structures might occur.

The determination of how much water an area can produce without creating undesirable effects requires analysis of both the hydrologic relationships between a pumped well and the source aquifer, and the legal constraints defining the degree to which specific effects can be tolerated. Performing such an analysis on the large aquifer systems of the arid southwest is particularly difficult because physical and legal factors change radically over very short distances. Consequently, the specific location of pumping has a great influence on the impacts of water development in any given case. Because quantitative data on aquifer performance are generally not available in most valleys or areas being considered, and because M-X wells have not yet been designed or located, it is not possible to evaluate the impacts of M-X water development in any detailed or quantitative sense.

The method used to evaluate impacts of the M-X project on groundwater resources incorporates the fundamental assumption that M-X water needs for both construction and long-term operations will be met locally by developing valley fill groundwater resources beyond the current level of development within each valley or hydrologic subunit. It is recognized that this may not turn out to be the case, particularly in areas where legal constraints are significant, but until the water development plans are better defined, this assumption provides a consistent framework for comparing potential impacts from one area to another.

An evaluation was performed of the relative potential for M-X water development actions which could result in significant detrimental impacts on groundwater availability. The factors used in the analysis were:

1. The volume of recoverable water in storage in the upper 100 feet of saturated valley fill (total estimated recoverable storage used in Texas/New Mexico)

2. The volume of current groundwater use

3. The relative volume of the proposed M-X withdrawal

4. The estimated perennial yield of the system (not used in Texas/New Mexico)

5. Legal constraints on groundwater development

The method of analysis provides an indirect measure of the potential for impacts to occur on a valley-by-valley or area-by-area basis. Whether or not these impacts actually do occur, and to what degree they occur, would depend on the location and construction details of M-X wells, the pumping rate and duration, the hydraulic characteristics of the aquifer(s) in the area of pumping, and the degree of hydraulic continuity between M-X wells and points of current water use.

PROPOSED ACTION (4.3.1.1.2)

DDA Impacts

The relationship between the Proposed Action in each hydrologic subunit with present water resources is shown in Figure 4.3.1.1-2.

Figure 4.3.1.1-3 shows present water usage rates and M-X DDA peak year demands. These values, expressed as percentage of perennial yield, are given for each hydrologic subunit. The figure shows in which valleys the present usage rate exceeds the perennial yield and thus where aquifer storage is currently being depleted. The figure also identifies those valleys which are not presently overdrafted but could be during the DDA construction period. The percentage of overdraft can be seen, thus giving some indication of the present stress and M-X-induced stress on the system. The relative size of the new M-X-induced demands to the present usage rate is also illustrated.

Figure 4.3.1.1-4 presents the relative volume of water in storage in each of the hydrologic subunits. The relative magnitude of current water use over a 3-year period (shortest construction period for a construction group) is compared to the M-X DDA construction 3-year demands. If one assumes that all of the M-X DDA construction demands will be met by a depletion of storage (rather than intercepted recharge or discharge), then impacts on groundwater availability are likely to be less severe in those valleys with relatively large storage reserves. Similarly, if the real extent of the valley fill aquifer is large, as reflected by the storage factor used in the analysis, then more options are available for locating and spacing wells so as to minimize short- and long-term groundwater impacts. This graph uses a log scale to present relative values.

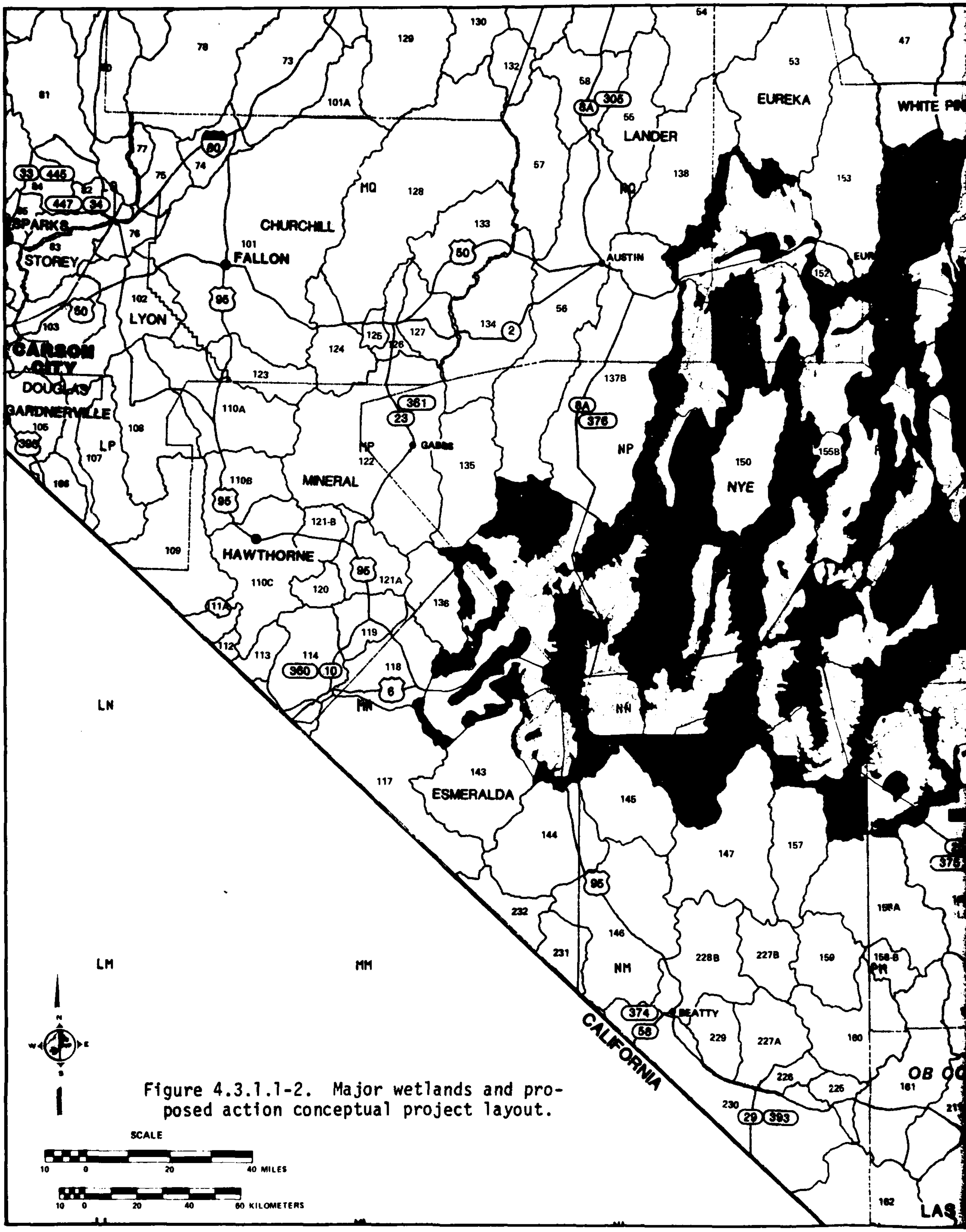
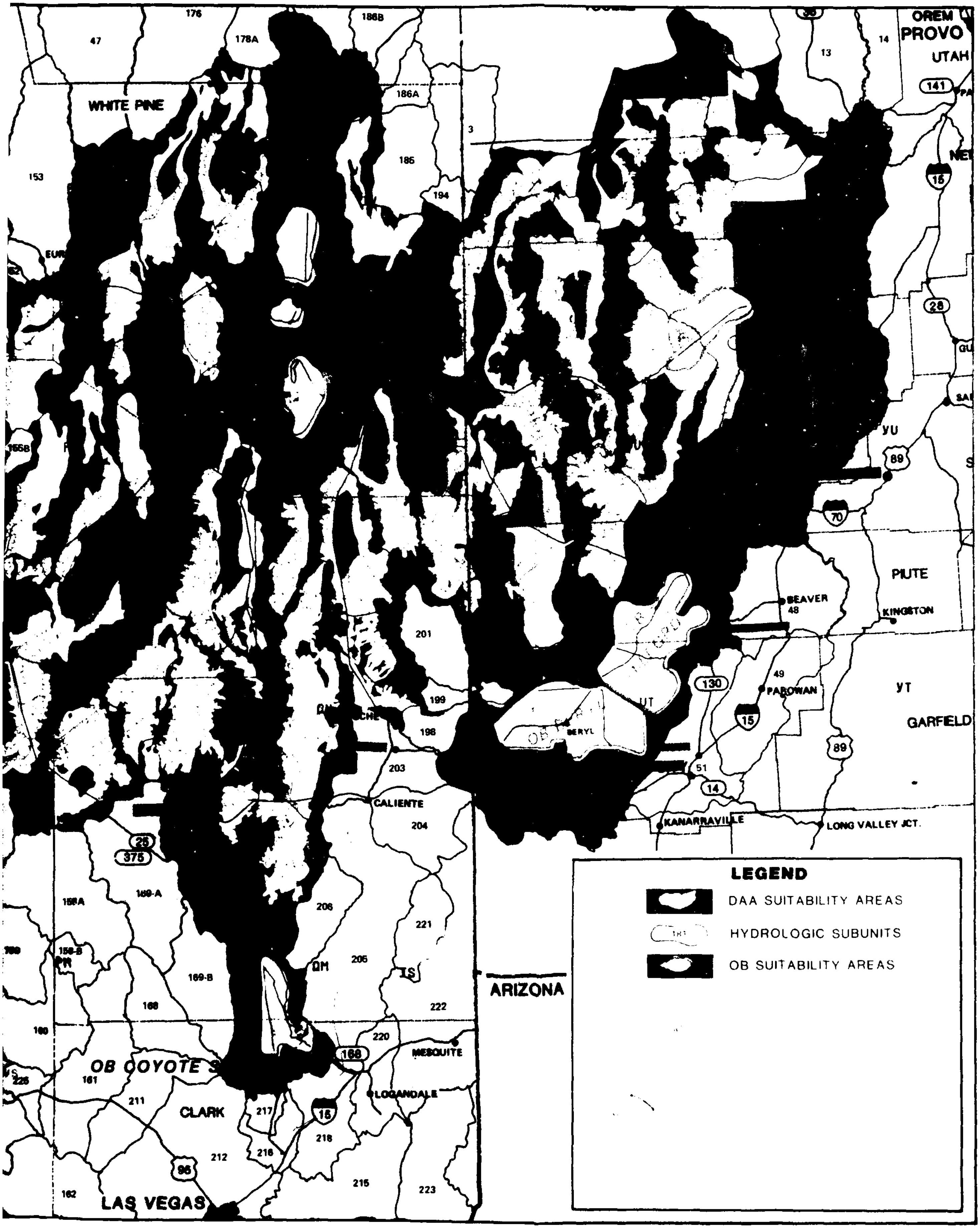


Figure 4.3.1.1-2. Major wetlands and proposed action conceptual project layout.


LEGEND
DAA SUITABILITY AREAS
HYDROLOGIC SUBUNITS
OB SUITABILITY AREAS
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PROVO
UTAH
WHITE PINE
PIUTE
GARFIELD
BEAVER
KINGSTON
PAROWAN
BERYL
CALIENTE
KANARRAVILLE
LONG VALLEY JCT.
ARIZONA
MESQUITE
LOGANDALE
CLARK
LAS VEGAS
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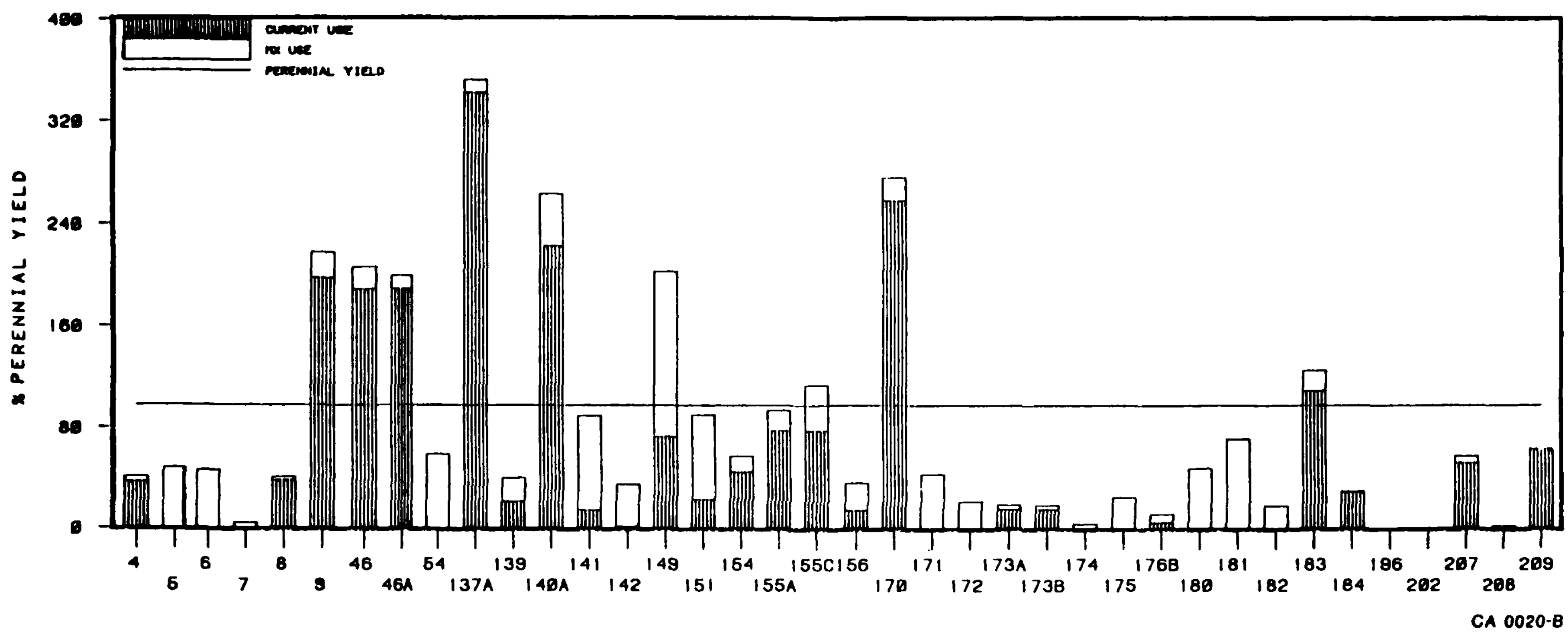

Figure 4.3.1.1-3. Valley-by-valley comparison of present water usage rate and projected construction peak-year usage rate with perennial yield. (Groundwater mining is occurring in those subunits where current use exceeds perennial yield.)

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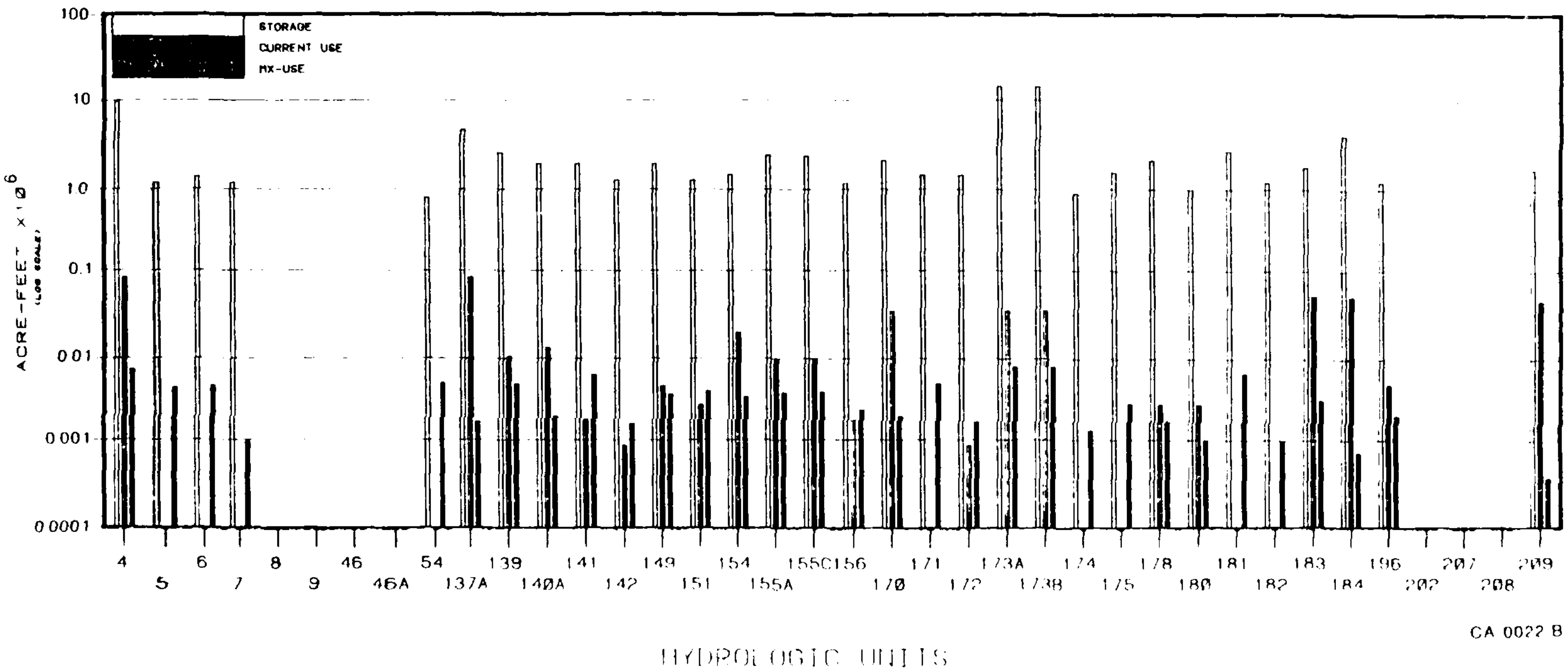


Figure 4.3.1.1-4. Valley-by-valley comparison of present groundwater in storage; 3-year usage at present rate and water demand for M-X DDA construction.

There will be a heavy demand in each of the DDA valleys for a period ranging from 2 to 5 years to support the construction activities. After this period the water requirement for M-X will be minimal with the largest uses being the approximately 100 acre-ft per year required in the four subunits where ASC are located.

Although the pumping stresses of DDA construction are short-term, the determination of whether impacts will be short- or long-term again depend upon a complex set of variables that are site-dependent. A decrease in spring discharge rate may be long- or short-term depending on the completeness of recovery. Impacts may also become long-term even if recovery is complete, if for example, during the low flow period, plant or animal numbers are reduced or eliminated. The same logic may be applied to the impacts of well interference, water quality deterioration and decreasing regional flows.

Although some long-term impacts may occur due to the short-term M-X withdrawals, the analysis of gross groundwater resource characteristics indicates that the potential for widespread long-term impacts on groundwater availability is not great. For example, total M-X DDA construction water requirements, in every valley, represents less than one percent of the estimated recoverable water in storage in the upper 100 feet of saturated valley fill alluvium. In any event, water level recovery will begin following M-X DDA construction.

Nevada and Utah have established limits on the quantities of water available, so competition for the resource has become stronger. DDA construction may compete with major projects such as H. Allan-Warner Valley Project in Dry Lake Valley or an alunite mine in Wah Wah Valley. It may also compete with much smaller users seeking to develop small mining claims or establish irrigated farming. The M-X demands in the DDA are only temporary, however, and the impacts to other users could become long-term if timing is a critical element to their successes, or if during M-X use, the impact is of a magnitude that prohibits use of that diversion in the future.

The impacts to water resources in the DDA may also become long-term if the water diversions developed for M-X are utilized on a permanent basis for different purposes following construction. Water utilized for construction may become an irretrievable resource depending on local conditions. This is especially true in those valleys where "mining of groundwater" is already occurring (see Figure 4.3.1.1-3).

Hydrologic subunits which have the highest relative potential for significant impacts in Nevada/Utah are Pine, Wah Wah, Moniter, Ralston, Stone Cabin, Penoyer, Coal, and Lake.

Relative potentials for impacts are presented in Table 4.3.1.1-1. The rating system was devised by analyzing the five factors presented earlier. The level of significance of the impact in each subunit is not predictable at this time. That determination must wait until the completion of detailed studies at each point of diversion.

Many of the impacts cited are avoidable through careful well field design and the avoidance of those areas where future studies determine there is a high likelihood that these impacts will occur.

Table 4.3.1.1-1. Potential impact to groundwater availability in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	GROUNDWATER AVAILABILITY[1]	SHORT-TERM IMPACT[1]	LONG-TERM IMPACT[1]
	Subunits with M-X Cluster and DTN			
4	Snake	High	Moderate	Low
5	Pine	Low	High	Moderate
6	White	Low	*	*
7	Fish Springs	Moderate	Moderate	Low
8	Dugway	Moderately low	Moderate	Low
9	Government Creek	Moderately low	Moderate	Low
46	Sevier Desert	High	*	*
46A	Sevier Desert & Dry Lake[2]	Low	Moderate	Low
54	Wah Wah	Low	High	Moderate
137A	Big Smoky-Tonopah Flat	Moderate	Moderate	Low
139	Kobeh	Low	Moderate	Low
140A	Monitor—Northern	Moderate	High	Moderate
140B	Monitor—Southern	Moderate	*	*
141	Ralston	Moderate	High	Moderate
142	Alkali Spring	Low	Moderate	Low
148	Cactus Flat	Low	*	*
149	Stone Cabin[2]	Moderately low	High	Moderate
151	Antelope	Low	Moderate	Low
154	Newark[2]	Moderately low	Moderate	Low
155AC	Little Smoky—N&S	Low	Moderate	Low
156	Hot Creek	Moderate	Moderate	Low
170	Penoyer	Moderately low	High	Moderate
171	Coal	Low	High	Moderate
172	Garden	Low	Moderate	Low
173AB	Railroad—N&S	High	Moderate	Low
174	Jakes	Low	Moderate	Low
175	Long	Moderately low	Moderate	Low
178B	Butte—South	Moderate	Moderate	Low
179	Steptoe	High	*	*
180	Cave	Low	Moderate	Low
181	Dry Lake[2]	Low	Moderate	Low
182	Delamar	Low	Moderate	Low
183	Lake	Moderately low	High	Moderate
184	Spring	High	Moderate	Low
196	Hamlin	Low	*	*
202	Patterson	*	*	*
207	White River[2]	*	*	*
208	Pahroc	*	*	*
209	Pahranagat	*	Moderate	Low
	Overall DDA		Moderate	Low

3926-2

*Data not available.

[1]
- No impact. (Low availability.)
- Low impact. (Moderately low availability.)
- Moderate impact. (Moderate availability.)
- High impact. (High availability.)

[2]Conceptual location of Area Support Centers (ASCs).

The impacts to the groundwater may be minimized by the following mitigations:

- o Design well field to minimize interference with pumpage centers, springs, and local users.
- o Provide storage near each diversion to minimize pumping rate and thus local effects.
- o Eliminate the irrigation for revegetation of shelter sites thus decreasing necessary water quantities by at least 25 percent.
- o Utilize dust control material or method not requiring water.
- o Investigate alternative road building techniques that utilize less water.
- o Import water from abundant sources.
- o Establish water level and quality monitoring network.

In an attempt to reduce the potential impacts associated with M-X water demands the Air Force has commited to follow state water law and has filed applications for water appropriations with the State Engineer's Office. These applications are expected to receive careful review by staff and to be subject to public comment.

Coyote Spring Valley OB Impacts

An OB near Coyote Spring Valley would lie in a basin that is near the downstream end of a topographic trough that forms a regional groundwater system in the White River area (Figure 4.3.1.1-5). The Muddy River Springs area is an outlet of the subsurface flow for this sytem. On LANDSAT photos (Figure 4.3.1.1-6), irrigated vegetation is outlined in green.

Development of water resources in the Coyote Spring Valley area could reduce the regional flows which are the source for the Muddy River Springs. Any reduction of flow could have significant impact on the users of the water from Muddy River Springs and the Muddy River. The Muddy River Springs "are the base of the agricultural economy of the Moapa Valley" (Eakin, 1964) and agriculture is the economic base of the Moapa Reservation. Thus, not only could the demands from an OB located at Coyote Spring Valley reduce flow at an important spring, significantly impacting aquatic and terrestrial biota, but it could also affect water availability for the Native Americans on the Moapa Reservation.

Figure 4.3.1.1-7 shows current usage and OB operational demands for water relative to the perennial yield of the Coyote Spring Valley area and the other siting areas. Because of the proximity and hydrologic interrelationships between the areas, the Coyote Spring Valley site was analyzed jointly with the Coyote Spring, Kane Springs and Moapa Spring Valley hydrologic subunits.

It should be noted that unlike those for the DDA, the operational demands for the OB are large and long-term. The effects of construction demands at the OB site are not shown as the demands are relatively small and short-term although any impacts which may result from construction activities would be accentuated by operational activities. Operational demands are also compared to the estimated storage quantity, as presented in Figure 4.3.1.1-8. This comparison does not allow for recharge during the 30-year period, and should not be looked upon as an estimate of aquifer life. Rather, it is to be used as a basis for comparison of relative storage sizes and of the relative severity of potential impacts caused by present usage rate and potential M-X demands.

Figures 4.3.1.1-7 and 4.3.1.1-8 indicate a high probability of impacts exist if an OB is constructed in the Coyote Spring Valley area. The impacts discussed earlier are made very significant by long-term diversion from an area with a small amount of local recharge. The relative potential impact at the Coyote Spring Valley site and the other potential OB sites are shown in Table 4.3.1.1-2. This table indicates that the relative potential for impact on groundwater at the Coyote Spring Valley site is high.

Potentially significant impacts could be reduced or avoided if the following mitigations were instituted:

- Obtain water from a source outside the regional system such as the Colorado River and transport it to the operating base location and to the location of significant M-X-induced population growth.
- Incorporate water saving features into all operating base and support community design (consider both construction and operation of the system).
- Utilize treated wastewater for irrigation and other nonpotable uses.
- Utilize infiltration basins to return treated wastewater to groundwater reservoir.
- Locate and manage well field to avoid direct impacts to springs and existing wells.

Milford OB Impacts

The proposed site for the OB at Milford is shown in Figure 4.3.1.1-9. Those areas where water is being used for irrigation, noted on the figure, are important as they are potentially the ones that would be most heavily impacted by the operating base.

The proposed OB at Milford would be situated in an area already experiencing a decline in water level. This would be the main effect leading to impacts already discussed. M-X demands would be approximately 11 percent of current use. While this would be a relatively small percentage, M-X use could accelerate the decline of the water table.

However, further appropriations are not being allowed by the Utah State Engineer in the area around Milford. Therefore, water will have to be obtained by

the acquisition of water rights from existing users. This acquisition could impact the agricultural base of the area because nearly 2,000 irrigated acres would have been removed from production in order to provide water to meet M-X demands.

The location of large agricultural areas near the OB site would increase the probability that long-term operations related to M-X withdrawals would have impacts on existing wells. Even if existing water rights are obtained to satisfy M-X demands, the potential for a decrease in water table still might occur as a result of prolonged or increased pumping. New impacts might also result from possible relocations of existing diversions.

The impacts are avoidable through importation of water from more abundant sources. Potential impacts can be reduced by careful design of the well fields. Importation of water has a favorable impact in that the water could be reused and made available for irrigation. This reclaimed water could be used to reduce M-X demands or sold to present irrigators.

Table 4.3.1.1-2 indicates that there is a moderate potential for impacts relative to other bases in Nevada/Utah, should an OB be located near Milford.

Mitigations would be the same as those discussed for the Coyote Spring Valley base although importation from the Colorado River Basin may be less viable.

ALTERNATIVE 1 (4.3.1.1.3)

DDA Impacts

The DDA configuration for Alternative 1 is the same as that for the Proposed Action and the potential impacts to the water resources in the DDA are the same.

Coyote Spring Valley OB Impacts

The OB site and water demands are the same as those for the Proposed Action and the potential impacts to the water resource at the OB site are the same.

Beryl OB Impacts

The area in the vicinity of the proposed OB near Beryl has been closed to further development by the Utah State Engineer. The reason for this can be seen in Figure 4.3.1.1-4. Present use greatly exceeds the estimated perennial yield of the area. Figure 4.3.1.1-8 compares the magnitude of present usage rate to the estimated quantity operation base sites. Figure 4.3.1.1-10 shows the location of the proposed site. The red in the satellite image clearly shows part of the large amount of irrigation (presently utilizing groundwater).

As in the other sites, nearly all of the present water usage is for irrigation. Because further development would not be allowed, existing water rights have to be purchased. This measure could remove approximately 2,000 acres from irrigation.

Existing users whose water rights were not purchased could be impacted by the change in pumping location, rate, and pattern. The impact could be primarily an increase in pumping cost due to the localized lowering of the groundwater table surrounding each well. This increased cost could eliminate marginal users.

Continued lowering of the groundwater table could result in impacts described in the introduction. M-X-induced demands would accelerate the water table decline. The potential impacts should be considered long-term and the rate of present use is placing an irretrievable commitment on the resource.

Table 4.3.1.1-2 indicates that location of a base in the Beryl area has a high potential for impact relative to other OB sites in Nevada/Utah.

Mitigations suggested for the Proposed Action could eliminate or reduce expected impacts.

ALTERNATIVE 2 (4.3.1.1.4)

DDA Impacts

The DDA configuration for Alternative 2 is the same as that for the Proposed Action and the potential impacts to the water resources in the DDA are the same as those described for the Proposed Action.

Coyote Spring Valley OB Impacts

The OB site and water demand are the same as those for the Proposed Action. The potential impacts to the water resources at the OB site have been described.

Delta OB Impacts

The potential site for the Delta OB is situated within two hydrologic subunits. These are already in a condition of overdraft (see Figure 4.3.1.1-7) and groundwater levels are declining. Part of the reason for this decline is irrigation (see Figure 4.3.1.1-11). Irrigation demands are satisfied mostly by groundwater. Reduction in surface flows have been reported and this trend can be expected to continue.

Present use of the resource is almost entirely for irrigation. Because new appropriations are not being approved, M-X-induced demands would have to be met by acquisition of water rights from present users. This acquisition would result in the removal from production of about 15 percent of the irrigated land in the Delta area. This change in use could be permanent and effect the economic structure of the area. However, economic changes directly resulting from locating an OB in the area far overshadow those from reductions in irrigated acreage for all except the individuals whose rights would be purchased and perhaps for them as well.

The size and probability of a reduction in irrigated land acreage would be increased by the presence of the Intermountain Power Project. Transfer of water rights for this plant have tentatively been accepted. The potential for significant economic impact from this purchase is so great that the State Engineer has indicated that additional transfer of water rights would not be allowed within the basin. This constraint would necessitate the importation of water from another source. Favorable impacts could occur in the Delta area if the imported water is properly reused. Impacts to the water source will need to be determined during Tier 2 studies when alternative sources can be identified.

Existing development has already seriously impacted the water resources. Current use is such that an irretrievable commitment of resource is being made. M-X-induced use on local sources would accentuate that commitment of irretrievable resources.

Should water demands continue to increase, impact such as decreased surface flows and increased pumping costs would become more significant. Competition for water in this area is extremely strong and implementation of M-X would probably eliminate marginally profitable users.

Table 4.3.1.1-2 indicates that the potential impacts will be moderately low. However, long-term effects could become moderately high relative to other OB sites in Nevada/Utah if IPP begins to use its allocation.

These impacts are avoidable only through importation of water but could be lessened by use of the mitigations presented in the Proposed Action.

ALTERNATIVE 3 (4.3.1.1.5)

DDA Impacts

The DDA configuration for Alternative 3 is the same as that for the Proposed Action and the impact to the water resources in the DDA are the same.

Beryl OB Impacts

The OB site is the same as that identified as a second OB in Alternative 1. Due to the larger population present at a first OB and the increased activities, water demands are higher. This will increase the stress on the water resources and raise the potential for significant impacts as the decline of the water table is increased. The larger demands would necessitate a larger well field thus increasing the area of potential impacts. A discussion of the potential impacts associated with a base at Beryl is presented earlier.

Ely OB Impacts

The proposed OB would be located in Steptoe Valley and the site is indicated in Figure 4.3.1.1-12 and 4.3.1.1-13. Some of the present water users are visible on the LANDSAT scene. Also of interest are the wetlands just north of the proposed operating base site. This is the outflow from Comins Lake, a private ranching operation Lake used by local residents for recreation as well as for water storage.

Steptoe Valley is also a candidate site for the White Pine Power Project electric generating station. This has resulted in the State Engineer "designating" Steptoe Valley as a critical groundwater basin. This is because the quantity of water appropriated or having applications on file, now exceeds the estimated perennial yield.

As shown in Figure 4.3.1.1-7, present water usage is much lower than the perennial yield. Ely along with Coyote Spring, are the only potential OB sites not now experiencing groundwater mining problems. This implies a reduced chance of significant impact. However, impacts at a local level could occur as described in the Proposed Action.

In Table 4.3.1.1-2, Ely was assigned a low relative potential for significant impacts relative to other OB sites in Nevada/Utah. However, if the White Pine Power Project uses its applications for appropriation, the possibility of impact increases.

Water is still a recoverable resource in this area and will be until the WPPP utilizes its total allocation. Possible mitigations to lessen impacts are presented in the Coyote Spring operating base discussion.

ALTERNATIVE 4 (4.3.1.1.6)

DDA Impacts

The DDA configuration for Alternative 4 is the same as that for the proposed action and the impact to the water resources in the DDA are the same.

Beryl OB Impacts

The OB site and the expected water demands are the same as identified in Alternative 3. The impacts of a first OB at Beryl are the same.

Coyote Spring Valley OB Impacts

The OB site is the same as that identified in the Proposed Action. However, in Alternative 4, Coyote Spring Valley would be a second OB site; water demands are thus reduced. The smaller demands should lessen the magnitude of potential impacts. The affected area will be reduced in proportion to the decreased size of the well field. There would still be the potential for impact to the Muddy River Springs and the Moapa River Springs and thus the Moapa Reservation. These impacts were discussed in the Proposed Action.

ALTERNATIVE 5 (4.3.1.1.7)

DDA Impacts

The DDA configuration for Alternative 5 is the same as that for the Proposed Action and the impact to the water resources in the DDA are the same.

Milford OB Impacts

The OB site is the same as that identified in the Proposed Action. However, in Alternative 5, Milford is an OB 1 site. The slight increase in water demands associated with the increased activities and larger population would further increase the stress on the water resources. Thus the potential for significant impact is greater and the impacted area would increase due to the increase in the required number of wells. Impacts were discussed in the Proposed Action.

Ely OB Impacts

The OB site and water demands are the same as those for Alternative 4 and the potential impacts of the OB are the same.

ALTERNATIVE 6 (4.3.1.1-8)

DDA Impacts

The DDA configuration for Alternative 6 is the same as that for the Proposed Action and the impact to the water resources in the DDA are the same.

Milford OB Impacts

The OB site is the same as that identified in the Proposed Action. However, in Alternative 6, Milford is an OB 1 site. The slight increase in water demands associated with the increased activities and larger population would further increase the stress on the water resouces. Thus the potential for significant impact is greater and the impacted area would increase due to the increase in the necessary number of wells. Impacts were discussed in the Proposed Action.

Coyote Spring Valley OB Impacts

The OB site is the same as that identified in the Proposed Action. However, in Alternative 6, Coyote Spring Valley is a second OB site; water demands are thus reduced. The smaller demands should reduce the size potential impacts. The affected area would be reduced in proportion to the decreased size of the well field. There will still be the potential for impact to the Muddy River Springs and thus the Moapa Reservation. These impacts were discussed under the Proposed Action.

ALTERNATIVE 7 (4.3.1.1-9)

DDA Impacts

In Figure 4.3.1.1-14, the system layout for Alternative 7 is overlayed onto a map of the region which delineates the major groundwater basins.

Impacts on groundwater availability which could result from M-X system deployment in Texas/New Mexico are similar to those discussed for the various alternatives involving Nevada/Utah. One difference between the two areas is that springs are generally very scarce or totally absent throughout much of the Texas/New Mexico siting area. Exceptions to this occur in Groundwater Regions I and II where a few springs issue from the Ogallala Formation along Running Water Draw. Groundwater development in these regions could result in some depletion of spring flow.

Moderate impacts on groundwater availability resulting from M-X DDA withdrawals are possible in all Groundwater Regions near M-X pumping centers yet to be located. The potential for significant regional impacts is thought to be low to moderate for the DDA water development based on analysis and comparison of the data summarized in Figure 4.3.1.1-15. The figure shows the relationship of the magnitude of M-X usage rate, current aquifer depletion, and recoverable groundwater storage.

M-X DDA water requirements could lead to short-term increases of 0.1 percent to 5 percent in current average aquifer depletion rates in all Groundwater Regions except Region IX. Short-term increases in aquifer depletion rates of 1

percent or more can assume significance if the projected economic life of the aquifer is already relatively short (less than 50 years, for example). This is the case in Regions VII and VIII.

Table 4.3.1.1-3 summarizes the results of the groundwater impact analysis by Groundwater Region.

Clovis OB Impacts

Impacts on groundwater availability resulting from the proposed operating bases in Texas and New Mexico were analyzed in the same manner as the DDA related impacts. Figure 4.3.1.1-16 shows, on a log scale, the relationships between available groundwater in storage, 30-year aquifer depletion, and 30-year M-X-induced water use for each operating base. Table 4.3.1.1-2 summarizes the results of the impact analysis for the Clovis operating base.

The Clovis area has experienced major depletions of groundwater mostly due to agricultural usage. The operating base demand will be greater than 5 percent of the present depletion rate; since the demand occurs over a projected 30-year period it is considered significant.

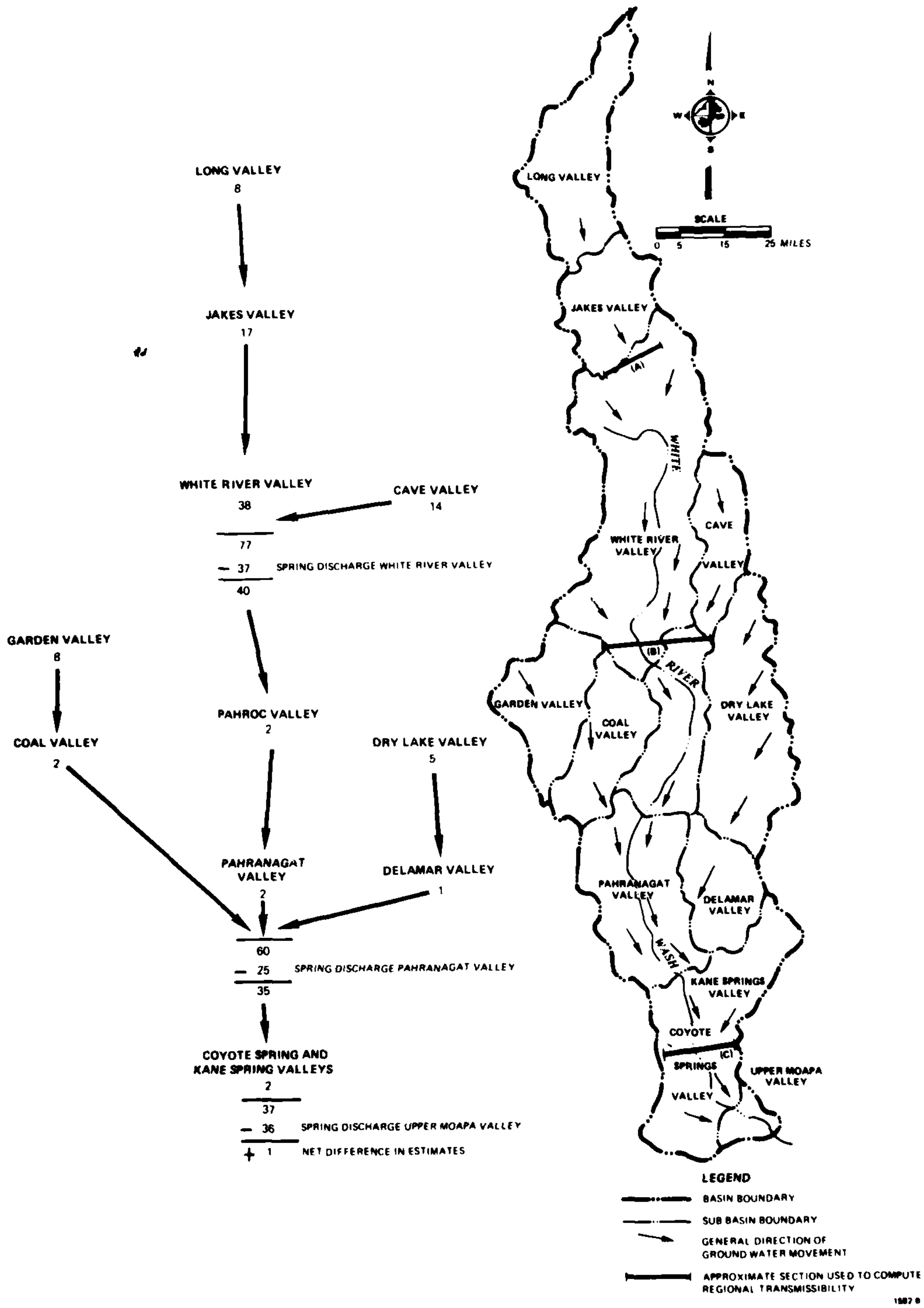
The significance of M-X withdrawals is further enhanced by the short projected economic life of the Ogallala Aquifer in Region VII and by the proximity of the proposed OB to the city of Clovis. Competition between the operating base and Clovis for the available groundwater resource could lead to a severe condition of aquifer depletion in the area. The major reason for this can be seen by examining the LANDSAT image (Figure 4.3.1.1-17) on which the projected operating base site has been placed. The large amount of irrigation in the area is clearly visible in the figure. The 1/4 section and larger center pivot irrigation systems are clearly visible. A comparison of LANDSAT Satellite scene for Nevada/Utah and Texas/New Mexico clearly shows more intensive agriculture in the latter.

Mitigations which could avoid or lessen the impacts are presented under Proposed Action.

Dalhart OB Impacts

Large volumes of economically recoverable groundwater are available in storage in groundwater Region III. M-X uses represent less than 1 percent of the current aquifer depletion rate and though some localized impacts may be felt near M-X pumping centers the overall potential for significant regional impacts on groundwater availability is judged to be low. See Figure 4.3.1.1-16 and Table 4.3.1.1-2.

The potential OB site for the Dalhart area and the amount of nearby irrigat~~ion~~ed agriculture is shown on Figure 4.3.1.1-18.



(Thomas E. Eakin, 1966)

Figure 4.3.1.1-5. Interbasin groundwater system.

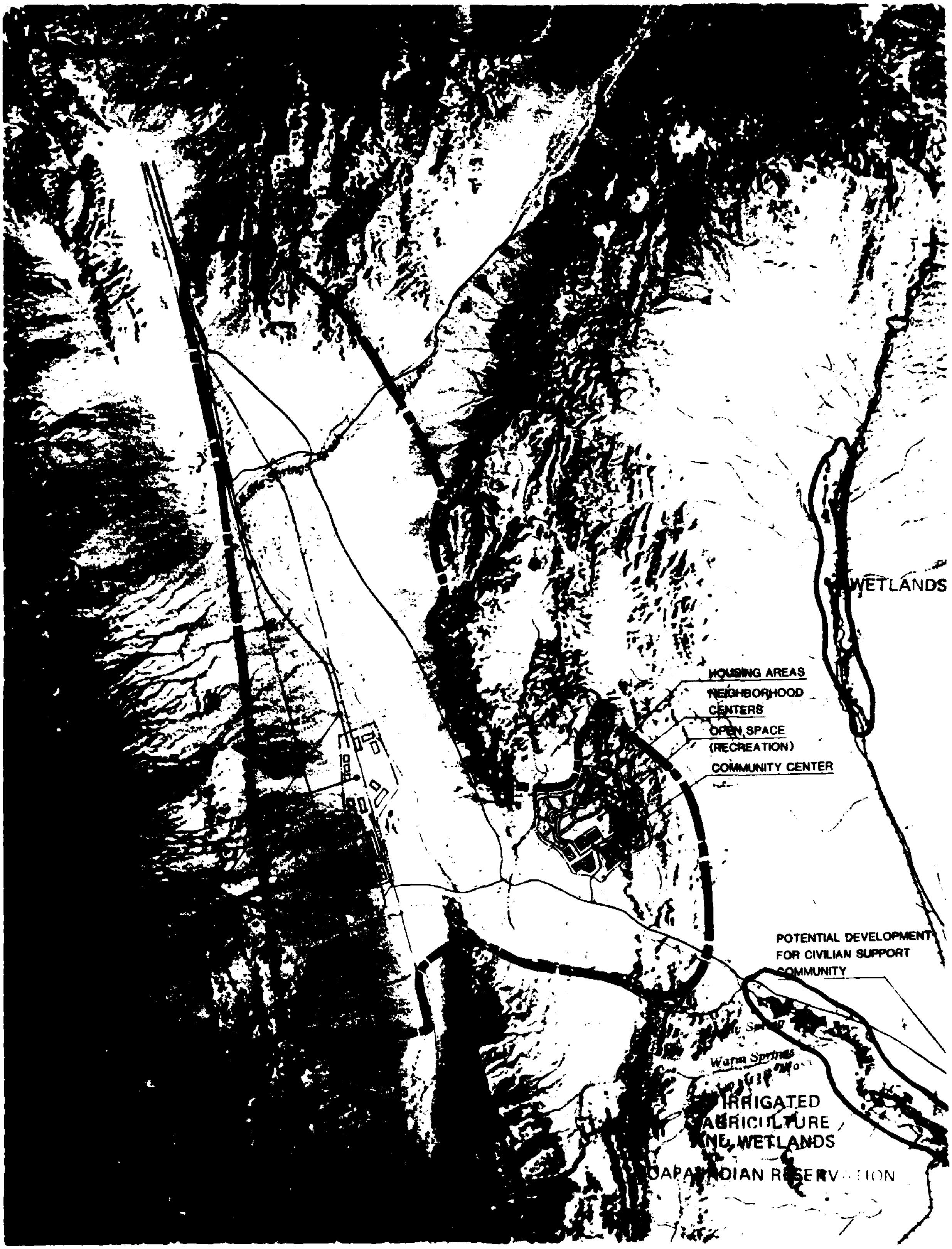


Figure 4.3.1.1-6. Coyote Spring, Nevada potential OB zone with watercourses (blue), irrigated agriculture and wetlands outlined (green).

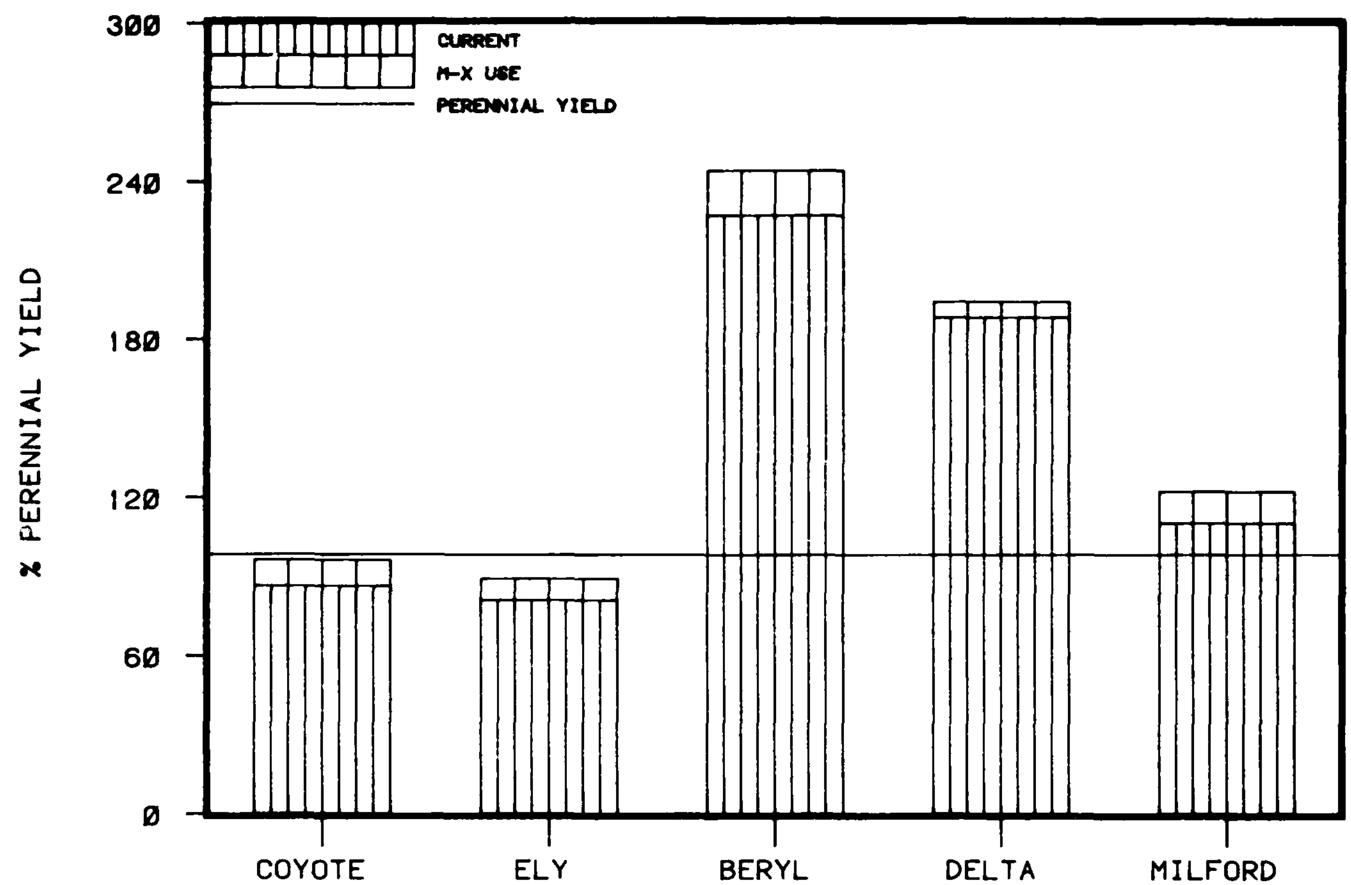


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Figure 4.3.1.1-7. Annual water use as % perennial yield for OB sites.

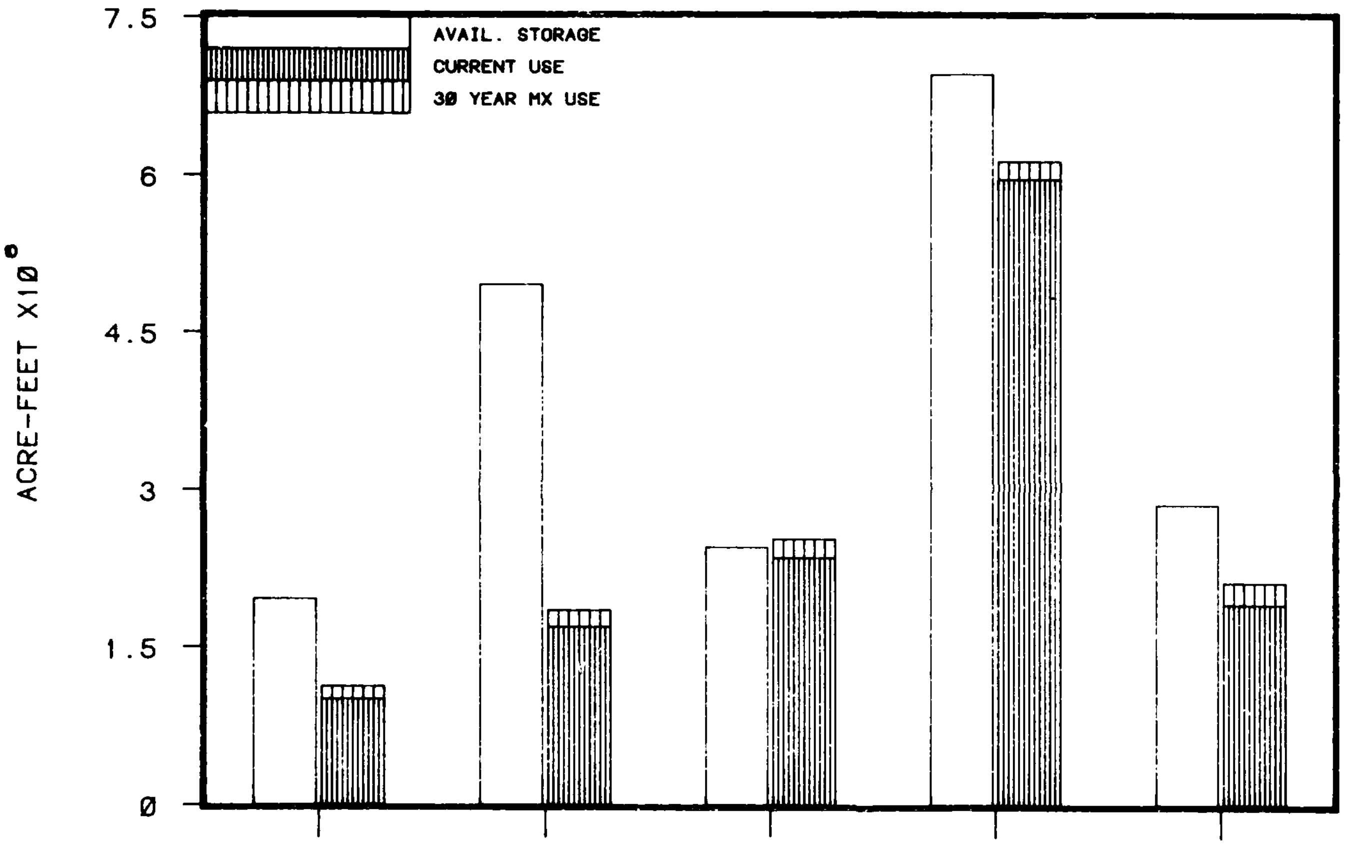

Figure 4.3.1.1-8. 30 year use and available groundwater storage (top 100 feet).

*Projected 30 yr use includes est 26000 ac-ft/yr WPPP.

Table 4.3.1.1-2. Potential impact to groundwater availability in the operating base areas for the Proposed Action and Alternatives 1-8.

HYDROLOGIC SUBUNIT OR COUNTY	GROUNDWATER AVAILABILITY[1]	SHORT-TERM IMPACT[1]	LONG-TERM IMPACT[1]
Beryl, UT (Alternatives 1,3,4)	*	High	High
Coyote Spring Valley, NV (P.A. and Alternatives 1,2,4,6,8)	Moderate	Moderate	Moderate
Delta, UT (Alternative 2)	Moderate	Moderate	Moderate
Ely, NV (Alternatives 3,5)	High	Low	Moderate
Milford, UT (P.A. and Alternatives 5,6)	High	Moderate	High
Clovis, NM (Alternatives 7,8)	*	Moderate	High
Dalhart, TX (Alternative 7)	*	Low	Low

3927-1

*Data not available.

[1]

- No impact. (Low availability)
- Low impact. (Moderately low availability)
- Moderate impact. (Moderate availability)
- High impact. (High availability)

Figure 4.3.1.1-9. Milford, Utah, potential OB zone with watercourses (blue), irrigated agriculture and wetlands outlined (green).

Figure 4.3.1.1-10. Beryl, Utah, potential OB zone with watercourses (blue) and irrigated agriculture, windmills, and mines (green).

Figure 4.3.1.1-11. Delta, Utah, potential OB zone with watercourses (blue) and irrigated agriculture, wetlands, and windmills (green).

Figure 4.3.1.1-12. Ely, Nevada, potential OB zones (north) with watercourses (blue) and irrigated agriculture, wetlands, and mines (green).

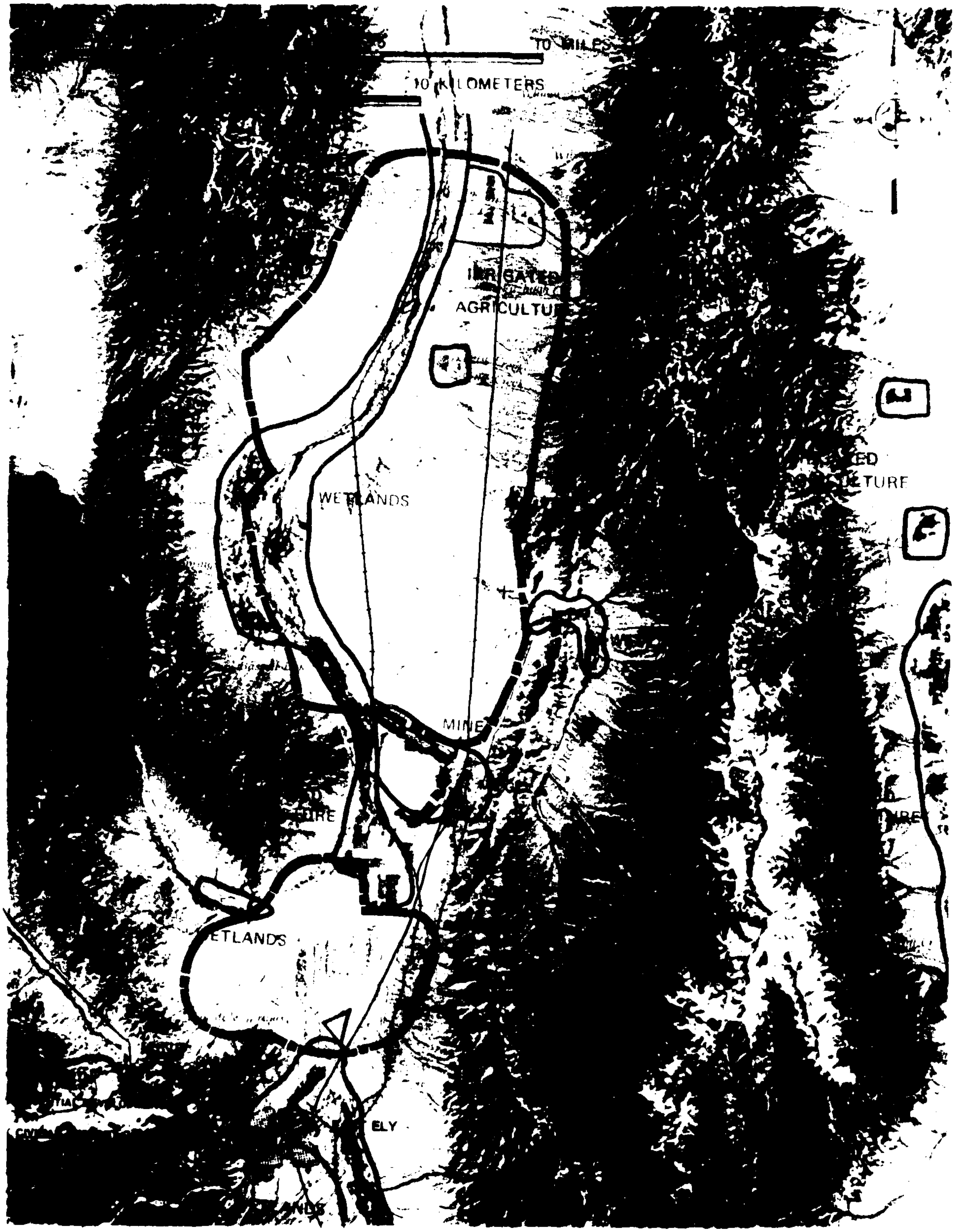

Figure 4.3.1.1-13. Ely, Nevada, potential OB zone (south) with watercourses (blue) and irrigated agriculture, wetlands, mines, and windmills (green).

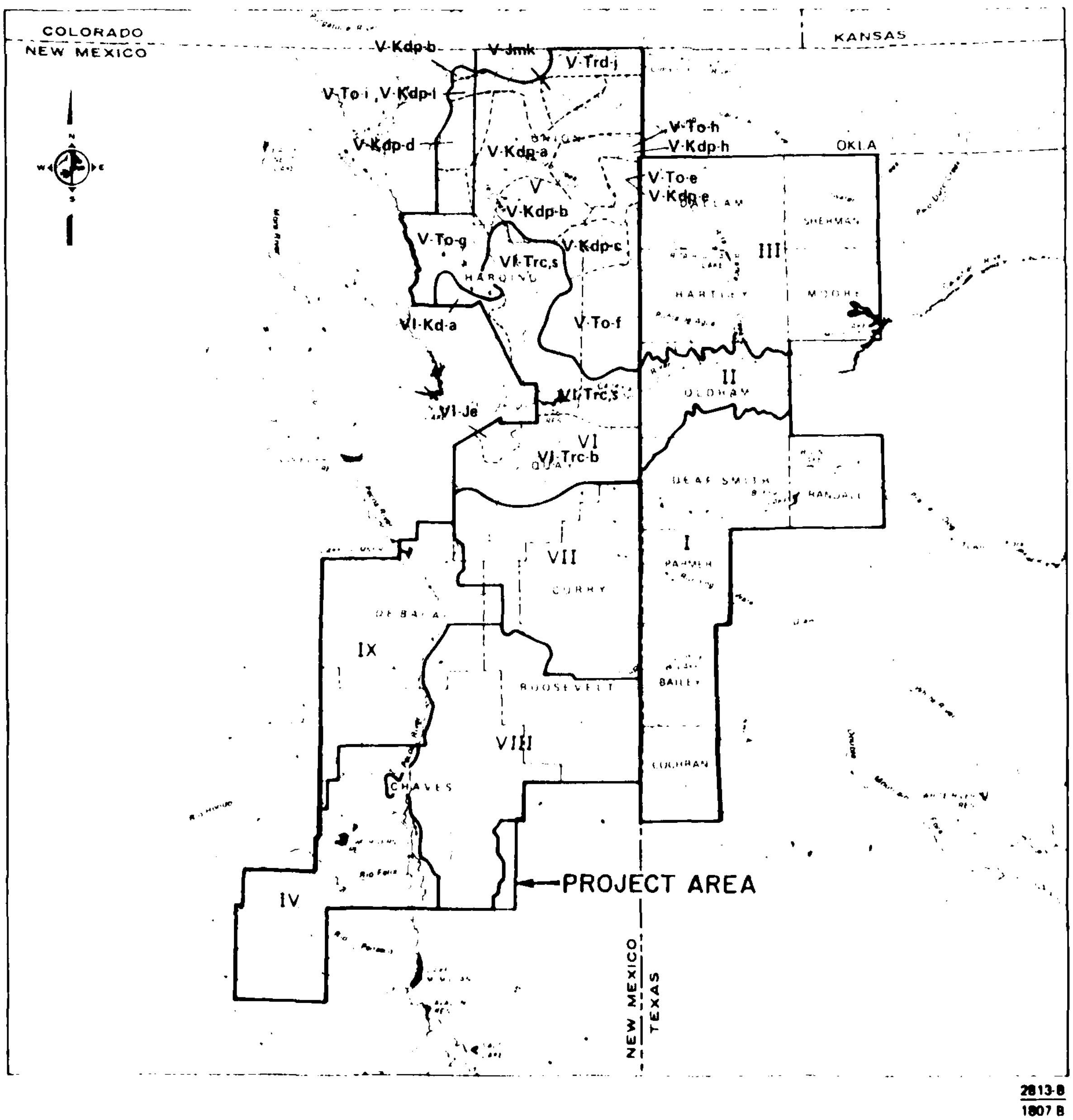

Figure 4.3.1.1-14. Groundwater regions and subregions.

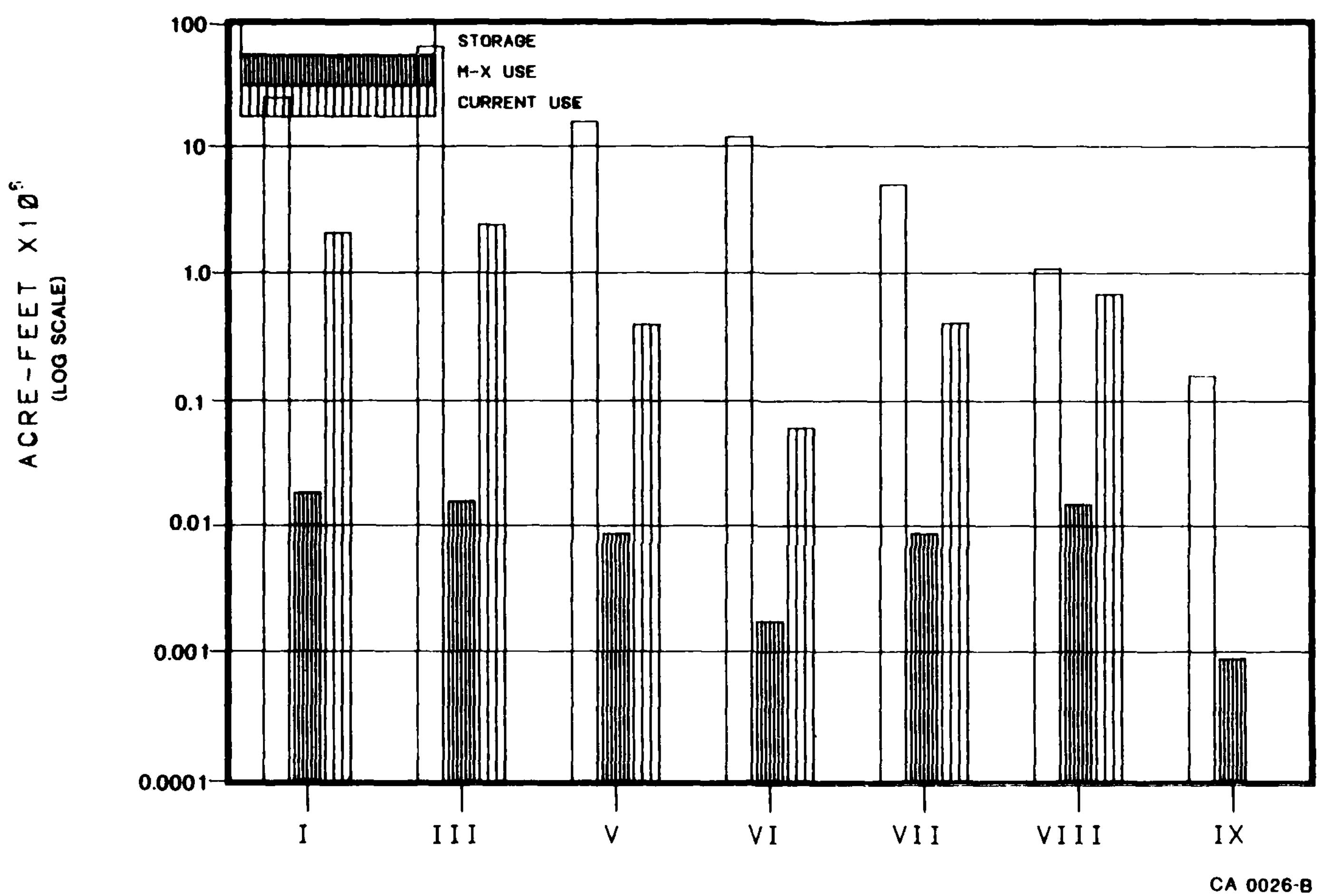

Figure 4.3.1.1-15. Available groundwater storage, 3-year aquifer depletion, and M-X use.

Table 4.3.1.1-3. Potential impacts to groundwater availability in Texas/New Mexico DDA for Alternative 7.

GROUNDWATER REGION	SHORT-TERM IMPACT[1]	LONG-TERM IMPACT[1]
I	Low impact	Low impact
III	Low impact	Low impact
V	Moderate impact	Low impact
VI	Moderate impact	Low impact
VII	Moderate impact	Low impact
VIII	High impact	Low impact
IX	Low impact	Low impact
Overall DDA	Moderate impact	Low impact

3928-1

[1] Key:
- No impact.
- Low impact.
- Moderate impact.
- High impact.

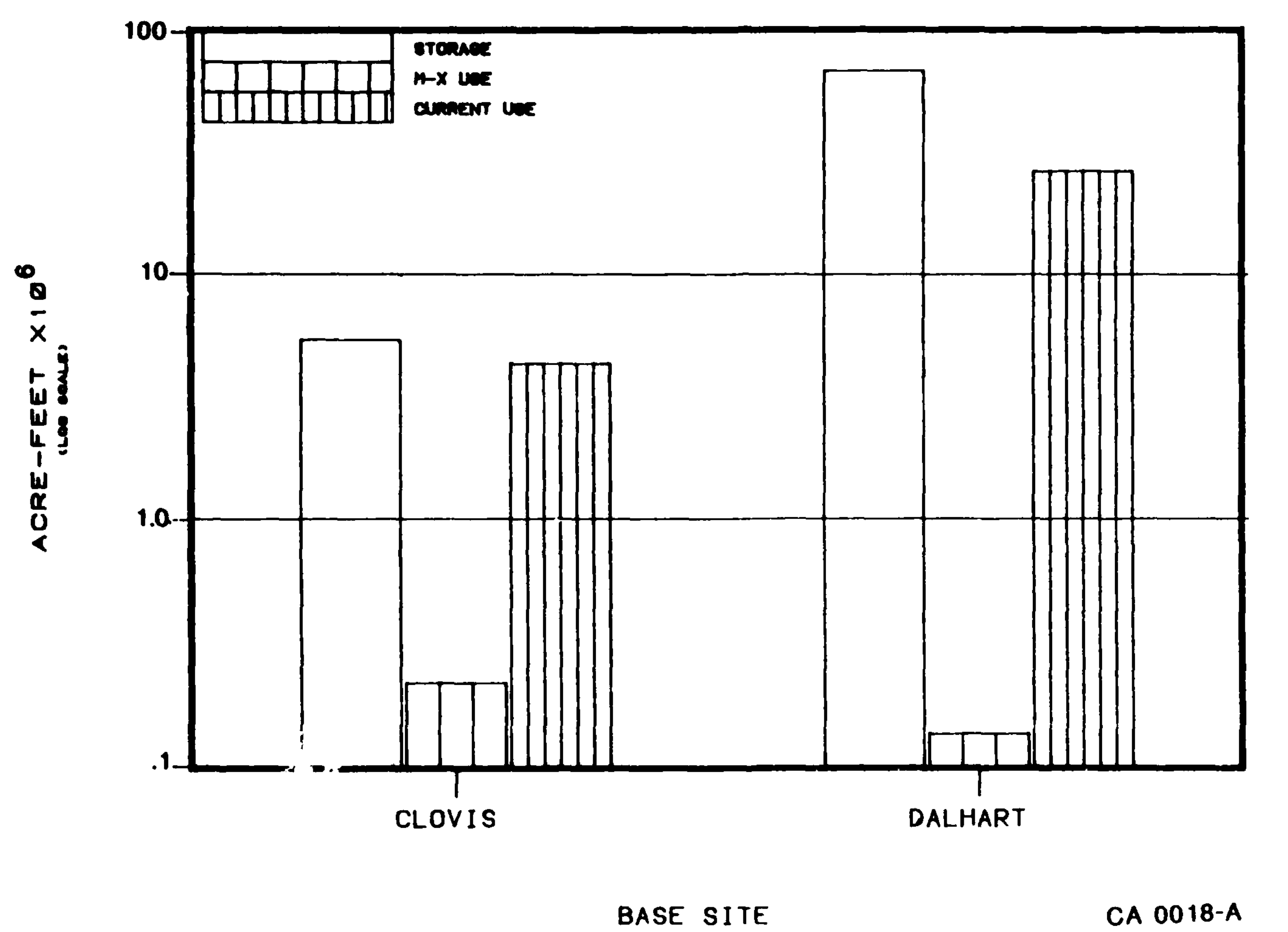

Figure 4.3.1.1-16. Available groundwater storage, 30 year aquifer depletion, and M-X use.

Figure 4.3.1.1-17. Clovis, New Mexico, potential OB zone with (green), and irrigated agriculture watercourses (blue), windmills (bright red field patterns).

Figure 4.3.1.1-18. Dalhart, Texas, potential OB zones with watercourses (blue) and irrigated agriculture, wetlands, and windmills (green).

ALTERNATIVE 8 (4.3.1.1-10)

DDA Impacts

The DDA configuration for Alternative 8 consists of a portion of the DDA in both the Nevada/Utah and the Texas/New Mexico regions. In Nevada/Utah those hydrologic subunits containing portions of the split basing layout would be affected to a degree similar to that discussed for the full basing system. Figure 4.3.1.1-19 presents key information given earlier in the Proposed Action but only for those subunits regions affected by the Alternative 8.

In Texas/New Mexico, water requirements for DDA construction are reduced in all Groundwater Regions under the split deployment alternative. For the purpose of the comparative analysis, however, the methods used to analyze potential for impacts on groundwater to occur are not very sensitive to small changes in M-X demands because the effects are dispersed over such large areas. Consequently, the declines in M-X water use had little effect on the results. Figure 4.3.1.1-20 shows the relationship between available groundwater storage, 3-year aquifer depletion at current levels of usage, and total M-X DDA uses for split deployment in Texas/New Mexico.

Table 4.3.1.1-4 presents the results of the analysis of potential for impacts on groundwater availability for Alternative 8. The results are the same as those for full deployment in Nevada/Utah and Texas and New Mexico, except in Groundwater Region VII where split deployment water requirements are less than 1 percent of the current aquifer depletion rate and the potential for impact, therefore, dropped from moderate to moderately low.

Coyote Spring Valley OB Impacts

The Coyote Spring Valley OB site and water demands are the same as those for the Proposed Action and the potential impacts to the water resources at the OB site are identified in that section.

Clovis OB Impacts

The Clovis OB site and water demands are basically the same as those for Alternative 7 and the potential impacts to the water resources at the OB site the same as those identified in that section.

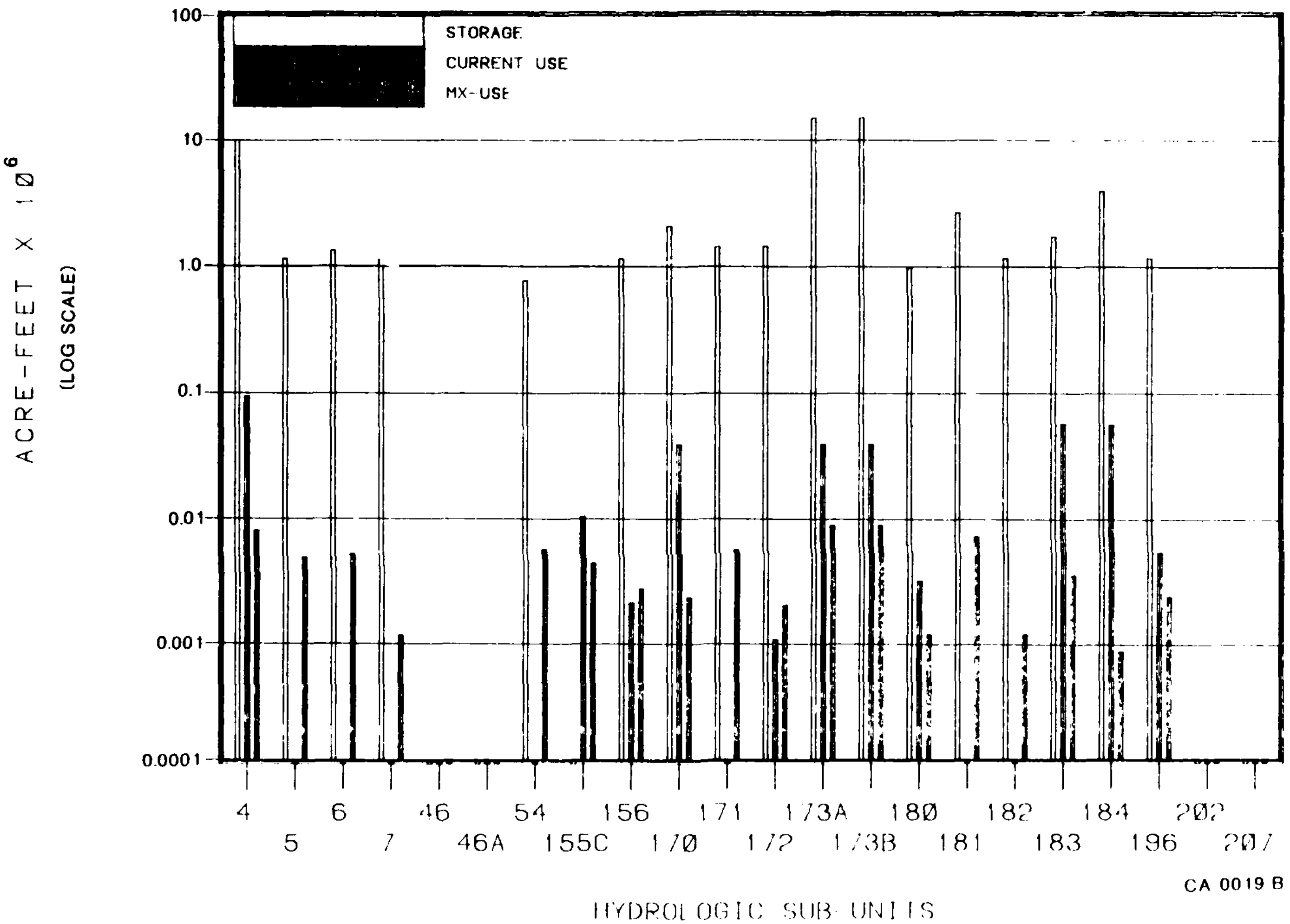

Figure 4.3.1.1-19. Available groundwater storage, 3-year current and M-X use for DDA (split basing Nevada/Utah).

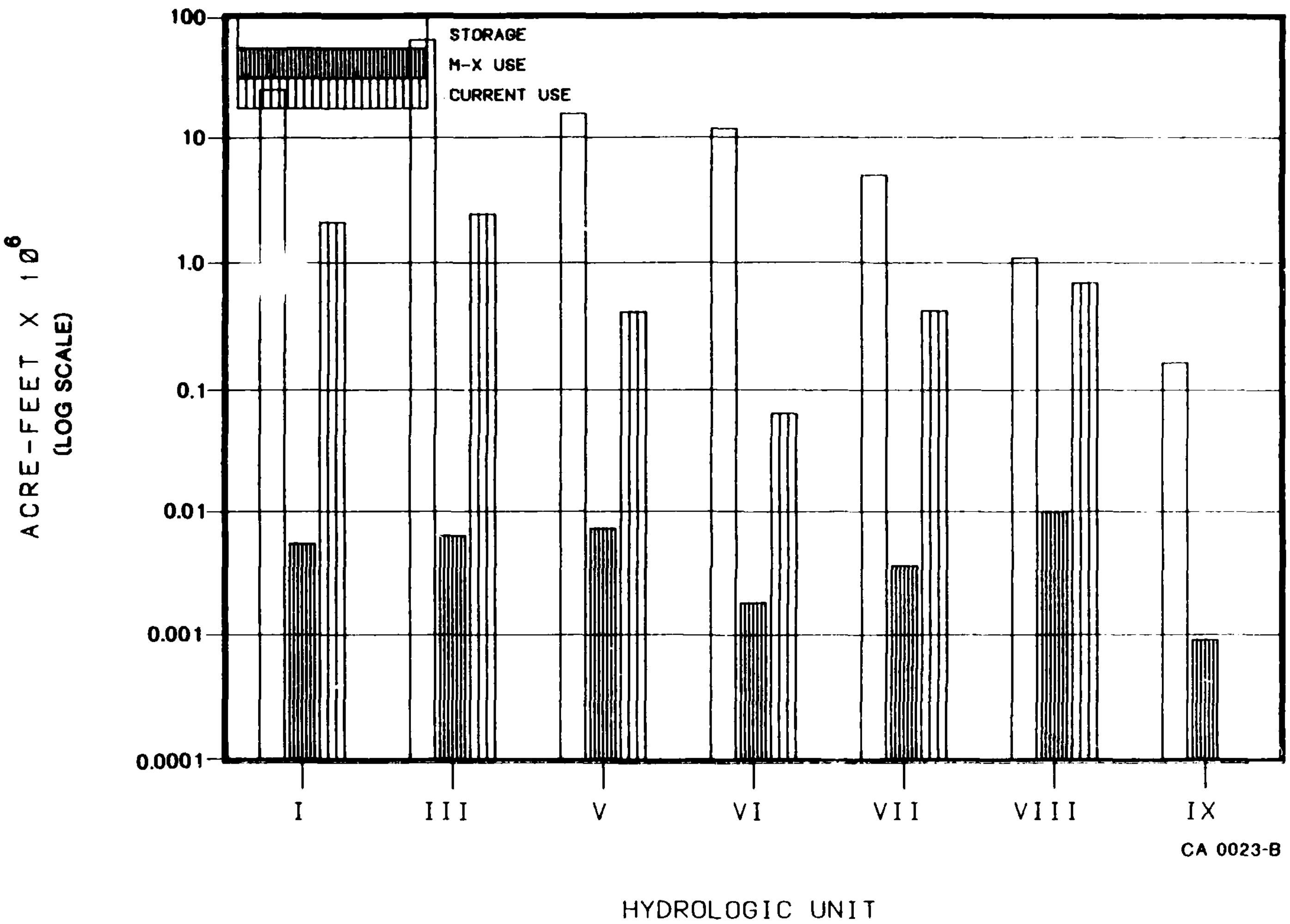

Figure 4.3.1.1-20. Available groundwater storage, 3-year aquifer depletion, M-X use (split basing, Texas/New Mexico).

Table 4.3.1.1-4. Potential impact to groundwater availability in Nevada/Utah and Texas/New Mexico DDAs for Alternative 8.

HYDROLOGIC UNIT OR GROUNDWATER REGION		GROUNDWATER AVAILABILITY[1]	SHORT-TERM IMPACT[1]	LONG-TERM IMPACT[1]
NO.	NAME			
	Subunits or Regions with M-X Clusters and DTN			
4	Snake			
5	Pine			
6	White		*	*
7	Fish Springs			
46	Sevier Desert		*	*
46A	Sevier Desert & Dry Lake[2]			
54	Wah Wah			
155C	Little Smoky—Southern			
156	Hot Creek			
170	Penoyer			
171	Coal			
172	Garden			
173AB	Railroad—N&S			
180	Cave			
181	Dry Lake[2]			
182	Delamar			
183	Lake			
184	Spring			
196	Hamlin		*	*
202	Patterson	*	*	*
207	White River	*	*	*
	Region I			
	Region III			
	Region V			
	Region VI			
	Region VII			
	Region VIII			
	Region IX			
	Overall DDAs			

3929-2

*Data not available.

[1]

No impact. (Low availability.)

Low impact. (Moderately low availability.)

Moderate impact. (Moderate availability.)

High impact. (High availability.)

[2]Conceptual location of Area Support Centers (ASCs).

SURFACE WATER

INTRODUCTION (4.3.1.2.1)

In the highly arid portions of the west, water is a commodity sought after for future development opportunities. Recognition of the importance of surface water resources is an integral element of M-X planning. Availability, quality and distribution of this significant resource is protected by state water law. Project developments will be in accordance with these laws.

Construction of the operating bases in the Nevada/Utah and Texas/New Mexico study regions will produce conditions that may make the sites more susceptible to water erosion of the soil. Based on the available site-specific soil survey information, each operating base site was rated as to its potential erosion impact. Slopes, soil types, and climatic conditions were all taken under consideration. As a result of this, relative values of high, moderate, and low potential impacts were assigned to each base.

To assess potential water erosion impacts from road and shelter construction in the Texas/New Mexico study region, it was assumed that the region has approximately the same rainfall patterns and an equal distribution of the different soil types. To predict erosion on a county basis, then, regional changes in topography were reviewed to see if areas of rolling topography existed anywhere in place of the dominant nearly level landscape.

The potential for water erosion and sedimentation problems resulting from road and shelter construction in the Nevada/Utah study region, was determined from three factors: 1) the number of miles of road construction planned per unit bajada and valley floor area, 2) the number of stream crossings (project defined) per unit bajada and valley floor area, and 3) the average annual amount of surface water which flows from the mountains to the bajadas. Relative values were assigned to these three factors for each valley and each valley was given an overall rating ranging from high potential erosion impact to low potential erosion impact.

PROPOSED ACTION (4.3.1.2-2)

DDA Impacts

Road and protective structure construction across the bajadas in the Nevada/ Utah study region will increase the potential for water erosion and sedimentation problems during major storm events. Accelerated erosion and sedimentation problems may include the potential undercutting of roads, widening and deepening of gullies, siltation of surface waters and fields, filling of highway and irrigation ditches, and the plugging of culverts. In addition, erosion causes the more productive surface layers of soil to be removed, making revegetation more difficult to establish. Proper engineering design will be employed where roads cross natural drainage to prevent gully formation and minimizing these potential problems.

Predicted water erosion impacts are summarized in Table 4.3.1.2-1 for each watershed in which DTN and protective structures would be deployed. Those valleys determined to have a high short-term erosion impact rating based on this analysis include Snake, Pine, Tule (White), Wah Wah, Kobeh, Monitor, Antelope, Garden, Jakes and Cave. These valleys both have a high density of road construction, relatively high stream crossing densities, and a moderate to high average annual runoff from the mountains. Those valleys determined to have low short-term potential erosion impact ratings include Government Creek, Sevier Desert, Pahranagat and Pahroc. These valleys generally have low construction densities, and either low stream crossing densities or low runoff or both. The remaining valleys all have moderate short-term potential erosion impact ratings.

Erosion impacts will be greatest during the construction period. Revegetation of the disturbed soils and proper engineering design of the roads will help mitigate the impacts after construction has been completed. Long-term impacts should be low if these mitigating measures are undertaken.

Coyote Spring Valley OB Impacts

The construction of an operating base in Coyote Spring Valley will result in a moderate short-term potential erosion impact rating as shown in Table 4.3.1.2-2. This rating is due primarily to the large construction activity density per unit area of the valley, the moderate erosion condition class of the undisturbed soils, and the steeper slopes found at this site. Revegetation of the disturbed soils as well as employment of proper engineering design will help mitigate the impacts after construction has been completed. The long-term impacts will not be significant if mitigation measures are employed.

Milford OB Impacts

The construction of an operating base in the Milford area will result in a low potential erosion impact rating (see Table 4.3.1.2-2) due to the generally level topography. Where local areas of sloping topography do exist, disturbed soils should be revegetated and proper engineering design should be employed. Long-term impacts are expected to be insignificant if mitigation measures are followed.

ALTERNATIVE 1 (4.3.1.2.3)

Alternative 1 DDA impacts and the Coyote Spring OB impacts are identical to those described for the Proposed Action. The second operating base for

Table 4.3.1.2-1. Potential water erosion impacts in the Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]
	Subunits with M-X Clusters and DTN		
4	Snake	High	High
5	Pine	High	High
6	White	High	High
7	Fish Springs	Moderate	Moderate
8	Dugway	Moderate	Moderate
9	Government Creek	Low	Low
46	Sevier Desert	Low	Low
46A	Sevier Desert & Dry Lake[2]	Low	Low
54	Wah Wah	High	High
137A	Big Smoky-Tonopah Flat	Moderate	Moderate
139	Kobeh	High	High
140A	Monitor—Northern	High	High
140B	Monitor—Southern	High	High
141	Ralston	Moderate	Moderate
142	Alkali Spring	Moderate	Moderate
148	Cactus Flat	Low	Low
149	Stone Cabin[2]	Moderate	Moderate
151	Antelope	High	High
154	Newark[2]	Moderate	Moderate
155A	Little Smoky—Northern	Moderate	Moderate
155C	Little Smoky—Southern	Moderate	Moderate
156	Hot Creek	Moderate	Moderate
170	Penoyer	Moderate	Moderate
171	Coal	Moderate	Moderate
172	Garden	High	High
173A	Railroad—Southern	Moderate	Moderate
173B	Railroad—Northern	Moderate	Moderate
174	Jakes	High	High
175	Long	Moderate	Moderate
178B	Butte—South	Moderate	Moderate
179	Steptoe	Low	Low
180	Cave	High	High
181	Dry Lake[2]	Moderate	Moderate
182	Delamar	Moderate	Moderate
183	Lake	Moderate	Moderate
184	Spring	Moderate	Moderate
196	Hamlin	Moderate	Moderate
202	Patterson	Moderate	Moderate
207	White River[2]	Moderate	Moderate
208	Pahroc	Low	Low
209	Pahranagat	Low	Low
	Overall DDA Impact	Moderate	Moderate

3839-1

[1]
- No impact.
- Low impact.
- Moderate impact.
- High impact.

[2]Conceptual location of Area Support Center (ASC).

Table 4.3.1.2-2. Potential water erosion impacts which could result from construction of operating bases for the Proposed Action and Alternatives 1-8.

	HYDROLOGIC SUBUNIT OR COUNTY	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]
	Beryl, UT (Alternatives 1,3,4)		
52	Lund District	Moderate impact	Moderate impact
53	Beryl-Enterprise District		
	Coyote Spring Valley, NV (P.A. and Alternatives 1,2,4,6,8)		
210	Coyote Springs	Moderate impact	Moderate impact
219	Muddy River Springs		
	Delta, UT (Alternative 2)		
46	Sevier Desert	Low impact	Low impact
46A	Sevier Desert-Dry Lake[2]		
	Ely, NV (Alternatives 3,5)		
179	Steptoe	Moderate impact	Moderate impact
	Milford, UT (P.A. and Alternatives 5,6)		
50	Milford[2]	Low impact	Low impact
52	Lund District		
	Clovis, NM (Alternatives 7,8)		
	Curry County[3]	Low impact	Low impact
	Dalhart, TX (Alternative 7)		
	Hartley County[3]	Low impact	Low impact

3840-1

[1] No impact.
Low impact.
Moderate impact.
High impact.

[2] Conceptual location of Area Support Centers (ASCs) for the Proposed Action and Alternatives 1-6.

[3] Conceptual location of Area Support Centers (ASCs) for Alternative 7.

this alternative is near Beryl, Utah. Short-term erosion impacts are expected to be moderate due to the high number of channel crossings in the area and the moderate erosion hazard already present in the predominating soils of the area (see Table 4.3.1.2-2). Impacts at the site can be mitigated through revegetation and proper engineering design. Long-term impacts are expected to be low with proper mitigation measures.

ALTERNATIVE 2 (4.3.1.2.4)

Alternative 2 DDA impacts and the Coyote Spring OB impacts are identical to those described for the Proposed Action. The second operating base for this Alternative is near Delta, Utah. Short-term erosion impacts are expected to be low (see Table 4.3.1.2-2) due to the limited runoff, relatively low construction density over the entire watershed, the very level topography, and the present slight erosion hazard of most of the predominating soils of the area. Any potential for erosion can be mitigated through revegetation of the disturbed soils and proper engineering design. Long-term impacts are expected to be insignificant with proper mitigation measures.

ALTERNATIVE 3 (4.3.1.2.5)

Alternative 3 DDA impacts and the Beryl OB impacts are identical to those described for the Proposed Action and Alternative 1. The second operating base for this alternative is near Ely, Nevada. Short-term erosion impacts are expected to be moderate (see Table 4.3.1.2-2) due to the present moderate erosion hazard rating of the predominating soils of the area, the presence of slopes of 3 to 5 percent, and a relatively high runoff from the mountains. Erosion impacts can be mitigated through revegetation of the disturbed soils and proper engineering design. Long-term impacts are expected to be low with proper mitigation measures.

ALTERNATIVE 4 (4.3.1.2.6)

Alternative 4 DDA impacts are identical to those described for the Proposed Action. The erosion impacts for the Beryl, Utah operating base are the same as those described under Alternative 1; the impacts for the Coyote Spring operating base are the same as those described under the Proposed Action.

ALTERNATIVE 5 (4.3.1.2.7)

Alternative 5 DDA impacts are identical to those described for the Proposed Action. The erosion impacts for the Milford, Utah operating base are the same as those described under the Proposed Action; the impacts for the Ely OB are the same as those described under Alternative 3.

ALTERNATIVE 6 (4.3.1.2.8)

Alternative 6 DDA impacts are identical to those described for the Proposed Action. The erosion impacts for the Milford, Utah operating base are the same as those described under the Proposed Action; the impacts for the Coyote Spring OB are also the same as those described under the Proposed Action.

ALTERNATIVE 7 (4.3.1.2.9)

Water erosion impacts in the Texas/New Mexico study region are expected to be low in all counties (see Table 4.3.1.2-3) and at the two OB sites (see Table 4.3.1.2-2) due to the nearly level topography found throughout the proposed layout. In addition, the soils of the region presently have low to moderate water erosion hazard ratings. Where local areas of rolling topography do exist, disturbed soils should be revegetated and proper engineering design should be employed. Any long-term impacts are expected to be insignificant with proper mitigation measures.

ALTERNATIVE 8 (4.3.1.2.10)

Water erosion impacts in the split basing alternative will be intermediate to the moderate impacts for the Nevada/Utah region and the overall low impacts for the Texas/New Mexico study region as shown in Table 4.3.1.2-4. Mitigating measures for areas where erosion will occur include revegetation and proper engineering design of the roads and facilities. Long-term impacts are expected to be low to non-existent with proper mitigation measures.

Erosion impacts for the Coyote Spring operating base are discussed under Proposed Action; the erosion impacts for the Clovis, New Mexico operating base are discussed under Alternative 7.

Table 4.3.1.2-3. Potential water erosion impacts in Texas/New Mexico DDA for Alternative 7.

COUNTY	SHORT-TERM IMPACT[1]	LONG-TERM IMPACT[1]
Bailey, TX	Low	Low
Castro, TX	Low	Low
Cochran, TX	Low	Low
Dallam, TX	Low	Low
Deaf Smith, TX[2]	Low	Low
Hartley, TX[2]	Low	Low
Hockley, TX	Low	Low
Lamb, TX	Low	Low
Oldham, TX	Low	Low
Parmer, TX	Low	Low
Randall, TX	Low	Low
Sherman, TX	Low	Low
Swisher, TX	Low	Low
Chaves, NM	Low	Low
Curry, NM[2]	Low	Low
DeBaca, NM	Low	Low
Guadalupe, NM	Low	Low
Harding, NM	Low	Low
Lea, NM	Low	Low
Quay, NM	Low	Low
Roosevelt, NM[2]	Low	Low
Union, NM	Low	Low
Overall DDA Impacts	Low	Low

3841-1

[1]
- None.
- Low impact.
- Moderate impact.
- High impact.

[2]Conceptual location of Area Support Centers (ASCs).

Table 4.3.1.2-4. Potential water erosion impacts in Nevada/Utah and Texas/New Mexico DDA for Alternative 8 (split basing).

HYDROLOGIC SUBUNIT OR COUNTY NO.	HYDROLOGIC SUBUNIT OR COUNTY NAME	SHORT-TERM IMPACT[1]	LONG-TERM IMPACTS[1]
	Subunits or Counties with M-X Clusters and DTN		
4	Snake[2]	High	High
5	Pine	High	High
6	White	High	High
7	Fish Springs	Moderate	Moderate
46	Sevier Desert	Low	Low
46A	Sevier Desert & Dry Lake[2]	Low	Low
54	Wah Wah	High	High
155C	Little Smoky—Southern	Moderate	Moderate
156	Hot Creek	Moderate	Moderate
170	Penoyer	Moderate	Moderate
171	Coal[2]	Moderate	Moderate
172	Garden	High	High
173A	Railroad—Southern	Moderate	Moderate
173B	Railroad—Northern	Moderate	Moderate
180	Cave	High	High
181	Dry Lake[2]	Moderate	Moderate
182	Delamar	Moderate	Moderate
183	Lake	Moderate	Moderate
184	Spring	Moderate	Moderate
196	Hamlin	Moderate	Moderate
202	Patterson	Moderate	Moderate
207	White River	Moderate	Moderate
	Bailey, TX	Low	Low
	Cochran, TX	Low	Low
	Dallam, TX	Low	Low
	Deaf Smith, TX	Low	Low
	Hartley, TX	Low	Low
	Hockley, TX	Low	Low
	Lamb, TX	Low	Low
	Oldham, TX	Low	Low
	Parmer, TX	Low	Low
	Chaves, NM	Low	Low
	Curry, NM	Low	Low
	DeBaca, NM	Low	Low
	Guadalupe, NM	Low	Low
	Harding, NM	Low	Low
	Lea, NM	Low	Low
	Quay, NM[2]	Low	Low
	Roosevelt, NM[2]	Low	Low
	Union, NM	Low	Low
	Overall DDA Impact	Moderate	Moderate

3842-1

[1] No impact.
Low impact.
Moderate impact.
High impact

[2] Conceptual location of Area Support Centers (ASCs).

Air Resources

AIR RESOURCES

INTRODUCTION (4.3.1.3.1)

Air quality impacts were assessed using air quality models that predict pollutant concentrations using meteorological and emissions data. The Point-Area-Line (PAL) and IMPACT models were used to predict particulate concentrations due to fugitive dust emissions from construction activity and wind erosion. The HIWAY model was run to predict gaseous pollutant levels due to vehicular emissions in the construction area and at the operating base during operations. The IMPACT model was also used to predict regional CO and NO_x levels in the operating base vicinity and community due to vehicles and space heating and cooling emissions. It was determined from the modeling results that certain primary disturbances, or M-X associated activities, would result in significant air quality impacts. Significant primary disturbances considered for the short-term were the following: operation of construction support facilities (NO_x), operation of construction support facilities (particulates), construction of clusters (particulates), and construction of the primary or secondary operating base and protective structures (particulates). The following primary disturbances were considered to be significant for the long-term: operation of the system (particulates) and operation of the primary or secondary operating base (particulates and CO).

The severity of impact in a given hydrologic subunit depends on the level and type of M-X activity (or primary disturbance) in a basin, as well as any air quality-related features of the basin such as, proposed or existing air pollutant sources and its geographic relation to any nonattainment areas, Class I areas, or other sensitive receptors. The air quality-related features of the hydrologic subunits of the deployment area for the Proposed Action and Alternatives 1 through 6 are shown in Table 4.3.1.3-1.

It was not possible to determine if additional combustion-related air pollutants such as SO_x may cause significant air quality impacts at the operating base during operations, since sufficient data was not available on electrical energy for the operating base. Also, sufficient data was not available on the magnitude, type, and extent of OB HC and NO_x emissions in order to determine if any oxidant problem would occur at any of the proposed or alternative operating base sites. Further NO_x

Table 4.3.1.3-1. Summary of air quality resource characteristics for each hydrologic subunit for the deployment areas of the Proposed Action and Alternatives 1-6 (page 1 of 3).

HYDROLOGICAL UNIT NO.	HYDROLOGICAL UNIT NAME	PROPOSED SOURCES	NONATTAINMENT AREAS	CLASS I AREAS	SENSITIVE RECEPTORS
(4)	Snake	—	None[1]	Within 100mi. of Cedar Breaks	Within 100mi. of Lehman Caves
(5)	Pine	Pine Grove molybdenum mine	None	Within 100mi. of Cedar Breaks, Zion, and Bryce Canyon	Within 30mi. of Lehman Caves
(6)	White	—	None	Within 100mi. of Cedar Breaks	Within 50mi. of Lehman Caves
(7)	Fish Springs	—	None[1]	None	—
(8)	Dugway	—	None[1]	None[1]	—
(9)	Government Creek	—	None[1]	None	—
(46)	Sevier Desert	IPP Power Plant, modular home factory, cement plant	None	Within 100mi. of Cedar Breaks, Zion, and Bryce	Town of Delta nearby
(46A)	Sevier Desert-Dry Lake	—	None	Within 100mi. of Cedar Breaks, Zion, and Bryce Canyon	—
(50)	Milford	Molybdenum Mine, geothermal plant	None[2]	Within 40mi. of Cedar Breaks, Zion, and Bryce Canyon	—
(54)	Wah Wah	—	None	Within 100mi. of Cedar Breaks	—
(137A)	Big Smoky-Tonapah Flat	Anaconda molybdenum mine	Near Gabbs Valley (TSP)	Within 100mi. of Death Valley	—
(139)	Kobeh	—	None	None	—
(140A)	Monitor Northern	—	None	None	—
(140B)	Monitor Southern	—	None	None	—
(141)	Ralston	Anaconda Mine	None	Within 100mi. of Death Valley	—
(142)	Alkali Springs	Anaconda Mine	None	Within 100mi. of Death Valley	—
(148)	Cactus Flat	—	None	Within 100mi. of Death Valley	—
(149)	Stony Cabin	—	None	Within 100mi. of Death Valley	—

3726

[1]Nearby Tooele County is nonattainment for SO_2, which is not a significant M-X pollutant.

[2]Nearby Cedar City is nonattainment for SO_2, which is not a significant M-X pollutant.

Table 4.3.1.3-1. Summary of air quality resource characteristics for each hydrologic subunit for the deployment areas of the Proposed Action and Alternatives 1-6 (page 2 of 3).

HYDROLOGICAL UNIT		PROPOSED SOURCES	NONATTAINMENT AREAS	CLASS I AREAS	SENSITIVE RECEPTORS
NO.	NAME				
(151)	Antelope	—	None	None	—
(154)	Newark	—	None	None	—
(155A)	Northern Little Smoky	—	None	None	—
(155C)	Southern Little Smoky	—	None	None	—
(156)	Hot Creek	—	None	Within 100 mi. of Death Valley	—
(170)	Penoyer	—	None	Within 100 mi. of Death Valley	—
(171)	Coal	—	None	Within 100 mi. of Delta Valley	—
(172)	Garden	—	None	Within 100 mi. of Death Valley	—
(173A)	Southern Railroad	—	None	Within 100 mi. of Death Valley	—
(173B)	Northern Railroad	—	None	Within 100 mi. of Death Valley	Duckwater Indian Reservation
(174)	Jakes	—	Adjacent to Steptoe Valley[3]	None	—
(175)	Long	—	Adjacent to Steptoe Valley[3]	None	—
(178B)	South Butte	—	Adjacent to Steptoe Valley[3]	None	—
(179)	Steptoe[3]	McGill smelter, Kennecott Copper Mine	Entire valley (SO_2) (considered for TSP)	None	—
(180)	Cave	—	Adjacent to Steptoe Valley[3]	None	—
(181)	Dry Lake	—	Near Steptoe Valley[3]	Within 100 mi. of Cedar Breaks and Zion	—
(182)	Delamar	—	None	Within 100 mi. of Cedar Breaks and Zion	—
(183)	Lake	—	Adjacent to Steptoe Valley[3]	Within 100 mi. of Cedar Breaks and Zion	—
(184)	Spring	—	Adjacent to Steptoe Valley[3]	Within 100 mi. of Cedar Breaks and Zion	Within 10 mi. of Lehman Caves

3726

[3]Steptoe Valley is nonattainment for SO_2 and being considered as nonattainment for TSP.

AD-A104 358 AIR FORCE SYSTEMS COMMAND WASHINGTON DC F/G 8/6

DRAFT ENVIRONMENTAL IMPACT STATEMENT. MX DEPLOYMENT AREA SELECT--ETC(U)

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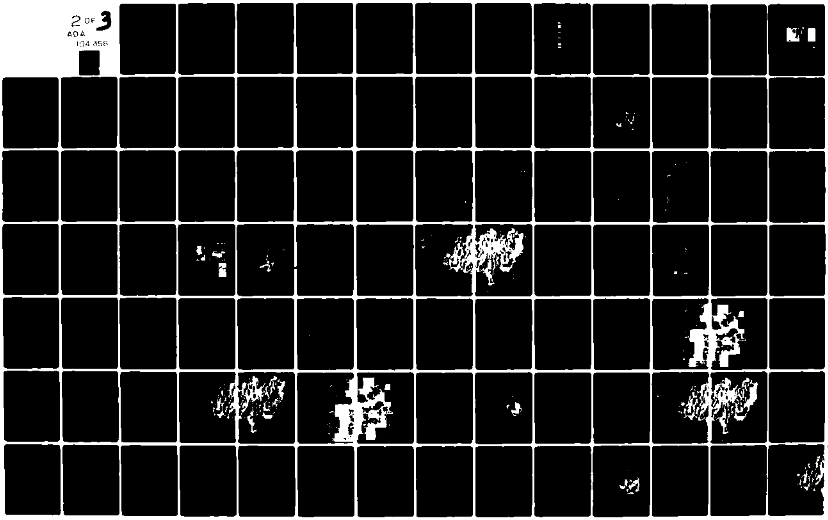


Table 4.3.1.3-1. Summary of air quality resource characteristics for each hydrologic subunit for the deployment areas of the Proposed Action and Alternatives 1-6 (page 3 of 3).

HYDROLOGICAL UNIT		PROPOSED SOURCES	NONATTAINMENT AREAS	CLASS I AREAS	SENSITIVE RECEPTORS
NO.	NAME				
(196)	Hamlin	—	Near to Steptoe Valley[3]	Within 100 mi. of Cedar Breaks and Zion	Within 10 mi. of Lehman Caves
(202)	Patterson	—	None	Within 100 mi. of Cedar Breaks and Zion	—
(207)	White River	—	Adjacent to Steptoe Valley[3]	None	—
(208)	Pahroc	—	None	None	—
(209)	Pahranagat	—	None	Within 100 mi. of Death Valley and Zion	—
(210)	Coyote Springs	Near to proposed Harry Allen Power Plant	Adjacent to Los Vegas (O_3, TSP, and CO)	Within 100 mi. of Zion	—
(53)	Beryl	—	None	Within 100 mi. of Cedar Breaks and Zion	—

3726

[3]Steptoe Valley is nonattainment for SO_2 and being considered as nonattainment for TSP.

emissions from the generators used at the construction camp may cause elevated NO_x levels to occur in the camp and vicinity, however, data concerning the generators was not sufficient to quantify the severity of the impacts.

PROPOSED ACTION (4.3.1.3.2)

DDA Impacts

The level of impact on air quality during the short- and long-term was assessed as being either no, low, moderate, or high impact. A table summarizing the short- and long-term impacts by hydrologic subunit for the DDA of the Proposed Action and Alternatives 1-6 is presented in Table 4.3.1.3-2. Existing air quality in the Nevada/Utah area is generally considered excellent with the exception of specifically identified areas such as the Steptoe Valley, Las Vegas Valley, and the Gabbs Valley nonattainment areas. Due to a copper smelter northeast of Ely, the Steptoe Valley has been identified by EPA as a nonattainment area for SO_2 and is being considered for redesignation to nonattainment status for TSP. The deployment area is characterized by complex terrain features. Locally poor dispersion conditions frequently occur during evening and early morning hours due to low inversion levels. The meteorological and terrain conditions tend to localize and increase air quality impacts for the periods when such conditions occur.

Significant air quality impacts will occur due to particulate emissions from M-X construction activity in Nevada/Utah. Under modeled conditions within the valleys, increased 24-hour particulate levels could occur as high as 160 ug/m^3 averaged over a 4 km square grid cell (the cell size used for modeling) due to construction of the DTN, cluster roads, and protective structures. Even greater particulate level increases that exceed state and federal air quality standards will result in localized construction areas. Therefore, basins with very dense M-X system activities were designated high impact in the short-term due to elevated dust levels predicted. Related effects generally are short-term visibility impacts, long-range transport effects that could extend short-term visibility impacts to the scenic vistas of Cedar Breaks National Park, Zion National Park, Bryce Canyon, Lake Mead National Recreation Area, Great Basin National Park (proposed), or the Lehman Caves National Monument Area. This is reflected in the analysis by impact significance levels of moderate to high impact in M-X basins within 40 to 100 mi of designated scenic areas. Temporarily increased dust levels will also occur at Duckwater Indian Reservation under certain wind and stability conditions. In addition, these areas would be potentially affected by increased dust from disturbed and exposed soil surfaces remaining after construction. Also, health problems may result from inhaled fugitive dust emissions in areas where zeolites, a suspected carcinogen, occur in the soil. Distribution of zeolites in the Great Basin soils is discussed under Mining and Geology (Section 4.3.1.4).

It is difficult to quantify air quality constraints which may be imposed on future development opportunities as a result of M-X. The most significant area of potential constraint is the depletion of allowable PSD increment, but for this issue, not only is it difficult to quantify the extent of depletion, it is also unclear as to whether or not the federal regulations even apply. As written in the Federal Register, the PSD increments are consumed in general as a result of emissions from new major stationary sources or modifications to such sources. The M-X related emissions are not from stationary sources but from area sources such as disturbed land surfaces and increased vehicular traffic over unpaved roads.

Table 4.3.1.3-2. Potential direct impact to air quality in Nevada/Utah DDA for the Proposed Action and for Alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]
4	Snake	Moderate	Low
5	Pine	Moderate	Moderate
6	White	Moderate	Low
7	Fish Springs	Moderate	Moderate
8	Dugway	Moderate	Low
9	Government Creek	Moderate	Low
46	Sevier Desert[2]	Moderate	Low
46A	Sevier Desert & Dry Lake[2]	Moderate	Low
54	Wah Wah	High	Moderate
137A	Big Smokey-Tonopah Flat	Moderate	Low
139	Kobeh	Moderate	Moderate
140A	Monitor—Northern	Moderate	Low
140B	Monitor—Southern	Moderate	Low
141	Ralston	High	Moderate
142	Alkali Spring	High	Moderate
148	Cactus Flat	Low	No impact
149	Stone Cabin	Moderate	Low
151	Antelope	High	Moderate
154	Newark[2]	Moderate	Low
155A	Little Smoky—Northern	Moderate	Low
155C	Little Smoky—Southern	Moderate	Low
156	Hot Creek	Moderate	Moderate
170	Penoyer	High	Moderate
171	Coal	High	Moderate
172	Garden	High	Moderate
173A	Railroad—Southern	Moderate	Low
173B	Railroad—Northern	Moderate	Low
174	Jakes	High	Moderate
175	Long	Moderate	Low
178B	Butte—South	Moderate	Low
179	Steptoe	Low	No impact
180	Cave	Moderate	Moderate
181	Dry Lake[2]	High	Moderate
182	Delamar	Moderate	Moderate
183	Lake	High	Moderate
184	Spring	Moderate	Low
196	Hamlin	High	Moderate
202	Patterson	Moderate	Low
207	White River[2]	Moderate	Low
208	Pahroc	Low	No impact
209	Pahranagat	Moderate	Low
	DDA Overall	High	Moderate

3895-1

[1] No impact.

Low impact. (A basin with a low level of construction activity, no major pollutant sources, no construction camp, and not within a significant distance of Class I or non-attainment areas.)

Moderate impact. (A moderate level of construction activity, or pollutant sources within a significant distance of Class I or nonattainment areas.)

High impact. (A high level of construction activity, and/or a construction camp within a significant distance of Class I nonattainment areas, or major pollutant sources.)

[2] Conceptual location of Area Support Centers (ASCs).

The TSP increment applicable to identified areas may be depleted in part by the overall effect of increased wind erosion from the new roads built during system construction and other exposed surfaces not revegetated, but determination of the amount or even the applicability of regulatory controls to such an increase will require complex regulatory decisions.

The level of impact assigned to the hydrologic subunits with operating bases is given in Table 4.3.1.3-3. The hydrologic subunits with operating bases were considered high impact areas during the short-term due to high particulate levels. During the long-term, elevated CO and particulate levels will cause moderate impact in the operating base vicinity.

Coyote Spring Valley OB Impacts

The Coyote Spring Valley operating base site, located in hydrologic subunit 210, is not within 100 mi of any Class I areas. It is within 20 mi of an existing power plant, the Reid Gardner Power Plant, and a proposed power plant, the Harry Allen Power Plant. Since the energy source for the operating base is uncertain, the potential cumulative air quality impact of these two power plants and the Coyote Spring Valley OB site is unknown. The Coyote Spring Valley hydrologic subunit is adjacent to Las Vegas Valley, designated as a nonattainment area for TSP, O_3, and CO. During construction of the operating base, fugitive dust from construction may aggravate the particulate problem in Las Vegas Valley. During operation, CO, HC, NO_x, and O_3, will increase at the operating base site and will increase to some degree at Las Vegas Valley due to population growth as a result of the M-X system.

The influx of M-X related people into the area would use a portion of allowable emissions offsets as outlined in the Las Vegas Valley Air Quality Implementation Plan. Depleting the offset allotment would make acquisition of such by another project more difficult. These considerations caused the hydrologic subunits with the Coyote Spring Valley operating base (Basin No. 210) to be designated high impact for the long-term.

Milford OB Impacts

The Milford operating base is in the hydrologic subunit 50. The base is within 100 mi of Zion and Bryce Canyon Class I areas and the Cedar Breaks proposed Class I area. Also, the Milford OB airfield is approximately 40 mi from the Cedar Breaks proposed Class I area. Elevated particulate levels due to fugitive dust caused by construction of the operating base or increased SO_x, NO_x, or oxidant levels during operation of the operating base may affect visibility at these Class I areas. However, sufficient data is not available concerning construction and operation of the operating base in order to determine if these possible impacts will be significant. Operation base community vehicular traffic will cause elevated CO concentrations to occur in the immediate vicinity of the operating base and the support community.

ALTERNATIVE 1 (4.3.1.3.3)

The location of the secondary operating base is the only difference between the Proposed Action and Alternative 1. See Table 4.3.1.3-2 for the impact significance of the DDA and Table 4.3.2.3-3 for the impact significance of the primary and secondary operating base. The secondary OB site for Alternative 1 is at Beryl, Utah, located in hydrologic subunit 53, rather than in basin 50 as in the

Table 4.3.1.3-3. Potential impact to air quality at operating bases.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	BERYL, UTAH (ALT. 1,3, & 4) SHORT-TERM IMPACTS[1]	BERYL, UTAH (ALT. 1,3, & 4) LONG-TERM IMPACTS[1]	COYOTE SPRING, NEVADA (P.A. & ALT. 1, 2, 4, 6, & 8) SHORT-TERM IMPACTS[1]	COYOTE SPRING, NEVADA (P.A. & ALT. 1, 2, 4, 6, & 8) LONG-TERM IMPACTS[1]	DELTA, UTAH (ALT. 2) SHORT-TERM IMPACTS[1]	DELTA, UTAH (ALT. 2) LONG-TERM IMPACTS[1]
46	Sevier Desert					High	Moderate
46A	Sevier Desert-Dry Lake[2]					Moderate	Moderate
50	Milford[2]						
52	Lund District	Moderate	Moderate				
53	Beryl-Enterprise District	High	Moderate				
179	Steptoe						
210	Coyote Spring			High	Moderate		
219	Muddy River Springs			Moderate	Moderate		
	Overall OB	High	Moderate	High	High	High	Moderate

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	ELY, NEVADA (ALT. 3 & 5) SHORT-TERM IMPACTS[1]	ELY, NEVADA (ALT. 3 & 5) LONG-TERM IMPACTS[1]	MILFORD, UTAH (P.A. & ALT. 1, 5 & 6) SHORT-TERM IMPACTS[1]	MILFORD, UTAH (P.A. & ALT. 1, 5 & 6) LONG-TERM IMPACTS[1]
46	Sevier Desert[2]				
46A	Sevier Desert-Dry Lake[2]				
50	Milford[2]			High	High
52	Lund District			Moderate	Moderate
53	Beryl-Enterprise District				
179	Steptoe	High	Moderate		
210	Coyote Spring				
219	Muddy River Springs				
	Overall OB	High	Moderate	High	Moderate

3899-4

- (blank bar) None.
- (open bar) Low.
- (hatched bar) Moderate.
- (solid bar) High.

Note: Hydrographic basins with operating bases were considered high air quality impact areas during the short-term due to the high level of construction activity, causing elevated particulate levels. During the long-term, elevated CO and particulate levels could cause moderate impact in the operating base vicinity.

[2]Conceptual location of Area Support Centers (ASCs)

Proposed Action. All impact significance values assigned to the remaining basins do not change because the configuration of clusters and roadways is identical under both alternatives. Impacts within hydrologic subunit 53 are significant for Alternative 1, during both short- and long-term periods. Impacts in hydrologic subunit 50 changes to a no impact level for Alternative 1. The Beryl, Utah, OB site is within 100 mi of the Cedar Breaks proposed Class 1 area and Zion National Park, an existing Class I area. It is not near any areas designated nonattainment for pollutants significant to the M-X system impacts.

ALTERNATIVE 2 (4.3.1.3.4)

The location of the second operating base is the only difference between the Proposed Action and Alternative 2. See Table 4.3.1.3-2 for the impact significance of the DDA, Table 4.3.1.3-3 for the impact significance of the second operating base. The secondary OB site for Alternative 2 is at Delta, Utah, located in hydrologic subunit 46, rather than in basin 50 as in the Proposed Action. All the impact significance values assigned to the remaining basins do not change because the configuration of clusters and roadways is identical under both alternatives. For Alternative 2 hydrologic subunit 46 is ranked 5 during the short-term period and a 4 during the long-term period. Hydrologic subunit 50 changes to a no impact level. The Delta OB site is greater than 100 mi from the Cedar Breaks proposed Class 1 area and Zion National Park, existing Class I area. It is not near any areas designated nonattainment for a pollutant considered significant to the M-X system.

ALTERNATIVE 3 (4.1.3.5)

The DDA for Alternative 3 is the same as that of the Proposed Action. Therefore, impact significance assigned to all hydrologic subunit in the deployment area are the same for Alternative 3 as for the Proposed Action, with the exception of those basins with the first and second operating base sites. Beryl, Utah, in hydrologic subunit 53, is the location of the primary operating base site for Alternative 3. See Table 4.3.1.3-2 for the impact significance of the DDA and Table 4.3.1.3-3 for the impact significance of the Ely operating base. The secondary operating base site is at Ely, Nevada, located in hydrologic subunit 179. These basins are assigned the high impact significance level for the short-term period and a moderate level for the long-term period. Short-term problems concern elevated particulate levels caused by particulate emissions from construction of the operating base. CO emissions from vehicles will cause elevated CO concentrations in areas adjacent to high density vehicular traffic in the operating bases and support communities. This will be a long-term impact.

Impact significance for the Beryl first operating base will be nearly identical to those described under Alternative 1 for the second base configuration. Differences were considered to be undetectable at the level of this analysis.

ALTERNATIVE 4 (4.3.1.3.6)

The significance of air quality impacts on air resources in Nevada and Utah due to the M-X system for Alternative 4 are nearly identical to those described for Alternative 1. Differences were considered insignificant for purposes of this analysis.

ALTERNATIVE 5 (4.3.1.3.7)

The impact significance for Alternative 5 are the same for the DDA as those described in the Proposed Action. The impact of the Milford first operating base are nearly identical to those described for the Milford second operating base of the Proposed Action. The impact significance is considered identical at the level of this analysis. The impact significance for the second operating base at Ely is the same as that described in Alternative 3 for the Ely secondary operating base.

ALTERNATIVE 6 (4.3.1.3.8)

The significance of air quality impacts on air resources in Nevada and Utah due to the M-X system for Alternative 6 are close to those described for the Proposed Action. Differences were considered insignificant for purposes of this analysis.

ALTERNATIVE 7 (4.3.1.3.9)

The methodology used to determine impact significance for the Texas/New Mexico region was the same as that discussed for the Nevada/Utah region. The county is the geographic unit considered in the Texas/New Mexico region as opposed to the hydrologic subunit used in Nevada/Utah basin and range province. For air quality purposes the county does not portray any boundaries to atmospheric processes, however, the county is a useful unit for this analysis as a geographic area defined by a certain density of M-X system activity and having certain baseline environment characteristics.

Table 4.3.1.3-4 shows the level of air quality impact in counties of the DDA. The type and level of M-X system activity in the county as well as the air quality-related characteristics of the county were considered in assessing the level of potential impact. County-specific features taken into account are shown in Table 4.3.1.3-5.

The same air pollution-related primary disturbances were considered in the Texas/New Mexico region as for Nevada/Utah. Fugitive dust emissions will be of primary concern in the deployment area during the short- and long-term. Fugitive dust emissions from construction activity and from the stationary sources that process construction materials processing will cause excessive localized particulate concentrations. Preliminary evidence indicates that elevated NO_x levels from NO_x emissions are due to the generators located at construction camps, however precise quantification is not possible because of insufficient source data. All counties with one or more construction camps received a moderate to high impact rating for the short-term.

Construction of the operating bases will cause significant localized elevated particulate concentrations, therefore, the counties with operating bases (Curry, New Mexico and Hartley, Texas) were considered to be high impact areas during the short-and term. Curry and Hartley counties received long-term moderate impact ratings because of increased CO concentrations expected due to vehicles and space heating and cooling. The particulate nonattainment areas in Eddy County, which is south of and adjacent to Lea County, did not affect ratings for Lea County because of the transport distance and the southerly prevailing winds. M-X system impacts

Table 4.3.1.3-4. Direct impact to air quality in the Texas/New Mexico DDA for Alternative 7.

COUNTY	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]
Counties with M-X clusters and DTN		
Bailey, TX	Moderate impact	Moderate impact
Castro, TX	High impact	Moderate impact
Cochran, TX	Moderate impact	Moderate impact
Dallam, TX	High impact	Moderate impact
Deaf Smith, TX	High impact	Moderate impact
Hartley, TX	High impact	Moderate impact
Hockley, TX	Moderate impact	Low impact
Lamb, TX	Moderate impact	Low impact
Oldham, TX	Moderate impact	Low impact
Parmer, TX	High impact	Moderate impact
Randall, TX	Moderate impact	Moderate impact
Sherman, TX	Moderate impact	Low impact
Swisher, TX	Moderate impact	Low impact
Chaves, NM	Moderate impact	Moderate impact
Curry, NM	High impact	Moderate impact
DeBaca, NM	Moderate impact	Low impact
Guadalupe, NM	Low impact	No impact
Harding, NM	Moderate impact	Moderate impact
Lea, NM	Moderate impact	Low impact
Quay, NM	High impact	Moderate impact
Roosevelt, NM	High impact	Moderate impact
Union, NM	Moderate impact	Low impact
Overall DDA	High impact	Moderate impact

3952-3

[1] (blank box) = No impact.

(boxes) = Low impact. (A countv with a low level of construction activity, no major pollutant sources, no construction camp, and not within a significant distance of Class I or nonattainment areas.)

(vertical hatching) = *Moderate impact.* (A moderate level of construction activity, or pollutant sources within a significant distance of Class I or nonattainment areas.)

(solid black) = High impact. (A high level of construction activity, and/or a construction camp within a significant distance of Class I nonattainment areas, or major pollutant sources.)

[2]Conceptual location of Area Support Centers (ASCs)

Table 4.3.1.3-5. Summary of air quality characteristics by county for Alternatives 7 and 8.

COUNTY NAME	EXISTING SOURCES	NONATTAINMENT AREAS	CLASS I AREAS	SENSITIVE RECEPTORS
Chaves (NM)	9-TSP, 1-SO_x, 4-NO_x, 3-CO, 4-HC	Adjacent to Eddy Co. (TSP)	Within 100 mi of Carlsbad and White Mountains	Near city of Roswell Bitter Lake NWR, and Salt Creek Wilderness
Curry (NM)	3-TSP	None	None	Near city of Clovis
DeBaca (NM)	1-TSP	None	None	—
Harding (NM)	—	None	Within 100 mi of Capulin Mountains	—
Lea (NM)	14-TSP, 11-SO_x, 11-NO_x, 1-CO, 13-HC	None	None	—
Quay (NM)	3-TSP, 1-SO_x, 1-NO_x, 1-CO, 1-HC	None	Within 100 mi of Capulin Mountains	Near city of Tucumcari
Roosevelt (NM)	5-TSP, 1-SO_x, 5-NO_x, 5-CO, 5-HC	None	None	Near city of Portales and Grulla NWR
Union (NM)	1-TSP, 1-SO_x, 1-NO_x, 1-CO, 1-HC	None	Within 100 mi of Capulin Mountains	Kiowa National Grassland
Bailey (TX)	7-TSP, 1-CO, 1-HC	None	None	Near Muleshoe NWR
Castro (TX)	12-TSP, 1-NO_x, 1-CO, 1-HC	None	None	—
Cochran (TX)	3-TSP, 1-SO_x, 1-NO_x, 1-CO, 1-HC	None	None	—
Dallam (TX)	4-TSP	None	Within 100 mi of Capulin Mountains	Rita Blanca National Grassland
Deaf Smith (TX)	15-TSP, 2-SO_x, 2-NO_x, 2-CO, 2-HC	None	None	Near town of Hereford
Hartley (TX)	4-TSP	None	Within 100 mi of Capulin Mountains	Near town of Dalhart
Hockley (TX)	6-TSP, 2-SO_x, 2-NO_x, 2-CO, 3-HC	None	None	Near town of Levelland
Lamb (TX)	19-TSP, 2-SO_x, 2-NO_x, 2-CO, 2-HC	None	None	Near town of Littlefield
Oldham (TX)	5-TSP	None	None	—
Parmer (TX)	16-TSP, 1-NO_x, 1-CO, 1-HC	None	None	—
Randall (TX)	4-TSP	None	None	Near cities of Amarillo and Canyon and near Buffalo Lake NWR
Sherman (TX)	5-TSP	None	None	—
Swisher (TX)	16-TSP, 1-NO_x, 1-HC	None	None	Near town of Tulia

3736-1

on existing and proposed Class I areas of White Mountain, Pecos, Wheeler Peak, and Capulin Mountain, New Mexico, were reflected in higher ratings assigned to counties within 100 mi of the Class I areas.

ALTERNATIVE 8 (4.3.2.3.10)

The split basing alternative is identical in level of impact to portions involved of the Proposed Action and Alternative 7. See Table 4.3.1.3-6 for the impact significance of the DDA and the operating bases. Impacts described for the Coyote Spring Valley operating base (Proposed Action) and for the Clovis operating base (Alternative 7) were considered to be identical at this level of analysis.

Table 4.3.1.3-6. Direct impact to air quality in the Nevada/Utah and Texas/New Mexico DDAs for Alternative 8.

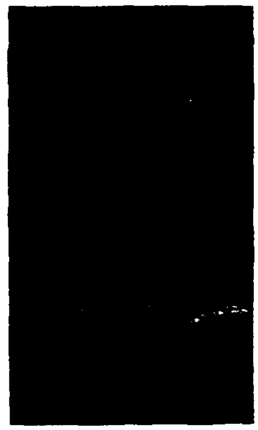
HYDROLOGIC SUBUNIT OR COUNTY NO.	HYDROLOGIC SUBUNIT OR COUNTY NAME	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]
Subunits or counties with M-X cluster and DTN			
4	Snake	Moderate	Low
5	Pine	Moderate	Moderate
6	White	Moderate	Low
7	Fish Springs	No	No
46	Sevier Desert	Moderate	Low
46A	Sevier Desert & Dry Lake[3]	Moderate	Low
54	Wah Wah	High	Moderate
155C	Little Smoky--Southern	Moderate	Low
156	Hot Creek	Moderate	Moderate
170	Penoyer	High	Moderate
171	Coal	High	Moderate
172	Garden	High	Moderate
173AB	Railroad N&S	Moderate	Low
180	Cave	Moderate	Moderate
181	Dry Lake[3]	High	Moderate
182	Delamar	Moderate	Moderate
183	Lake	Moderate	Moderate
184	Spring	Moderate	Low
196	Hamlin	High	Moderate
202	Patterson	Moderate	Low
207	White River	Moderate	Low
210	Coyote Spring[2]	High	Moderate
	Bailey, TX	Moderate	Low
	Castro, TX	Low	No
	Cochran, TX	Moderate	Moderate
	Dallam, TX	Moderate	Moderate
	Deaf Smith, TX	High	Moderate
	Hartley, TX[3]	High	Moderate
	Hockley, TX	Moderate	Low
	Lamb, TX	Moderate	Low
	Oldham, TX	Moderate	Low
	Parmer, TX	Low	No
	Randall, TX	Low	No
	Sherman, TX	Low	No
	Swisher, TX	Low	No
	Chaves, NM	Moderate	Moderate
	Curry, NM	High	Moderate
	DeBaca, NM	Moderate	Low
	Harding, NM	Moderate	Moderate
	Lea, NM	Moderate	Low
	Quay, NM	Moderate	Moderate
	Roosevelt, NM[3]	Moderate	Moderate
	Union, NM	Moderate	Low
	Overall DDA Impact	High	Moderate

3951-3

[1] (blank box) = No impact.* (boxes) = Low impact.* (dense lines) = Moderate impact.* (solid dark) = High impact.*

*See Table 4.3.1.2-2 for explanation of impact levels.
[2]Does not contain M-X clusters or DTN
[3]Conceptual location of Area Support Centers (ASCs)

Mining and Geology



MINING AND GEOLOGY

INTRODUCTION (4.3.1.4.1)

No direct impacts on any operating mines are anticipated. During construction there could be minor traffic delays, or rerouted traffic between mining concerns and the project. Although economically recoverable mineral deposits might be discovered, M-X interference with development of these mineral deposits would be slight. Exploration, including oil, water, and geothermal would continue as it would without M-X.

The deployment of the M-X system would not directly preempt any working mine by acquisition of its location. The cluster and road network in three Utah counties (Juab, Millard, and Beaver), and four Nevada counties (Lincoln, White Pine, Nye, and Eureka) might, however, impact individual mine workings and might interfere with access efficiency and ease of mine operation. These impacts would be limited to road delays during movement of heavy equipment and would not be expected to be significant. The cluster and road network also intrudes on areas of potential minerals development. Geologic survey and exploration may be no more than inconvenienced or delayed during the M-X construction phase.

More significantly, perhaps, the M-X project would affect the mining community through competition for the local labor resources. Individuals living in the area affected by M-X development may elect to give up their present employment in favor of working on the construction of M-X. Competition for labor resources would be most strongly felt in construction and construction-related industries such as mining. The larger unionized mines would experience less impact as workers would in most cases be unwilling to trade security for the short-term construction phase of M-X. As employees quit mining for M-X construction opportunities, the marginal mining establishments may become vulnerable. The larger firms should stay in the bidding for labor resources, although their costs may increase somewhat.

The areas of high resource value, whether metal, oil and gas, or geothermal, where M-X could conflict with known resource locations are listed in Table

4.3.1.4-1 for the Nevada/Utah valleys potentially affected by M-X. Siting flexibility reduces the potential for major conflicts with mineral resource development activities.

A counterbalancing set of factors represents the favorable impact of M-X on the minerals and energy resources industries. These factors are: (a) increased demand, as a result of M-X construction activities, for local raw minerals, building materials; e.g., sand and gravel, stone, gypsum, clays, lime, perlite, pumice, and volcanic cinder; and (b) improved access to remote areas of east central Nevada and west central Utah as a result of the M-X road network. Incorporation of these factors into the net impacts calculation involves the assumption of continuing operation and expansion of local quarrying and mining of building materials, with the M-X system as a prime consumer in the 1980s. Improved access for geologic prospecting and survey is a long-term benefit which will accrue over several years. In-migrating construction workers will have craft skills for mining operations and some may remain to seek permanent employment in mining opportunities after M-X construction.

The method used to evaluate quantifiable impacts of the M-X program consisted of the following steps:

1) Overlay the map of the proposed deployment of M-X system components on a map of mining claims. The claims map does not include recent claim activity (Post 1979).

2) Assume impacts would occur and be significant wherever a system component would cover an area having a large number of claims.

Because thousands of new claims were filed just after the M-X project was announced, no particular significance can be attached to relative numbers of claims.

The method is illustrated by the following analysis. In the southern end of Cave Valley is a concentration of 227 claims covering 4,886 acres. In this area the system places four shelters, four miles of road and directly affects sixty acres. Overall, however, M-X occupies a four mi^2 area from which the potential mines could be excluded. This shows that although the area directly covered by M-X --the shelters and roads -- is small, a much larger area can be precluded from development because of the presence of M-X components in a small portion of it. In carrying the analysis further there are, for example, three areas of mining claim concentration in Cave, Lake, and Coal valleys that have a high potential for producing economic mineral deposits. The Tier 2 environmental surveys will include an investigation of mineral value to ensure that economically developable resources are identified.

Air Force policy seeks to avoid preventing access to any known potential mineral deposits. It should be stressed that the M-X system analyzed for mining impacts will not necessarily be the final M-X system design. A program of field checking and limited drilling for confirmation of presence of mineral potential in questionable areas is included in the siting. Conflicts between exploration/production and M-X facilities will be resolved on a case-by-case basis.

Table 4.3.1.4-1. Areas of high mining and geological resource value in Nevada and Utah valleys potentially affected by M-X.

RESOURCE AREA	RESOURCE	LOCATION	COMMENTS
Railroad Valley	Oil	Entire valley	West central part has Nevada's only two producing oil fields. Entire valley has seen much exploratory activity.
Hot Creek and Reveille Valleys	Geothermal	T.7 & 8N, R.5051E	
Big Smokey Valley	Geothermal	T.11-14N, R.43E	High industrial process heat geothermal potential
Lake Valley	Minerals	T.1N, R67E	Heavy claim activity
Cave Valley	Minerals	T.5.N.R.6.3E	227 claims
Coal Valley	Minerals	T.2N, R.61E T.3N, R.61E	312 claims 93 claims
Hot Creek Valley	Minerals	T.7N, R.50E	115 claims adjacent to Tybo mining district
Steptoe Valley	Minerals	T.14N, R.63E	153 claims
Tonapah Area	Minerals	South end of Big Smokey Valley	Molybdenum
Escalante Desert	Geothermal	South of T.25S, east of R.10W	High geothermal potential and exploration activity.
Black Rock Desert	Geothermal		
Sevier Desert	Minerals	Key Mountains, Sheeprock Mountain	Uranium, base and precious metals
Dugway Valley	Minerals		Beryllium, fluorite, uranium
Fish Springs Flat	Minerals Geothermal	T.13S, R.11W T.12 & 13S, R.12 & 13W	
Sevier Lake Valley	Minerals	R.11W, T.20-22S	

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PROPOSED ACTION (4.3.1.4.2)

DDA Impacts

Mining development is a long-term resource commitment. From the date of discovery of a mineral deposit to the start of production may be as long as ten years. The economic life of a mining operation may be 30 to 50 years. Mining and mineral recovery is the most important economic activity within the M-X deployment area, second only to gaming in the state of Nevada. The present mining boom was brought about by an increase in the prices for minerals and by advances in exploration and recovery techniques. Because the deployment of M-X components could interact with mining operations at some locations, the economic development near these locations could be impacted.

No difference is apparent between the potentials for impacts at the OB site and in the DDA. No M-X design constraint has been identified which would cause an unavoidable impact on the development of mineral resources in Nevada/Utah.

Withdrawal of land presently held in mineral claims may have the potential of limiting immediate mineral development in the deployment area. Some of the ore deposits located under the valleyfill could not be developed during the useful life of the M-X components. This situation would be especially true for ores requiring open-pit mining. In addition to claims that could indicate large-scale mineral deposits, many claims are held by individuals and are worked on a part-time basis. Impact to these claims could affect the livelihood of the holders.

The drawdown on sand, gravel, and cement materials would be substantial during the construction phase of the M-X program. It would be miniscule during the operations phase. Access to the mineral deposits beneath M-X system components would only be delayed if impacted at all. Only the minerals used in building the M-X facilities would be irretrievably committed.

Any adverse impacts on the building-materials industries could be mitigated through appropriate planning. Mining claims occupied by M-X components would require that the holder of the claim be compensated. Most economically viable claims could be avoided by careful siting of the M-X components. Tables 4.3.1.4-2 and 4.3.1.4-3 indicate the level of impact expected in each hydrologic subunit and a comparison of the impacts around each OB pair.

Coyote Spring Valley OB Impacts

The Coyote Springs OB would be located in an area of little mining activity and few mining claims. The nearest mining activity is in nonmetallics, gypsum, silica, and sand and gravel. The OB is not expected to impact these concerns except perhaps to increase the development of sand and gravel sites.

Milford OB Impacts

The Milford OB site is located near the south end of the Star range. Further north in the Star Range is in the Star Mining district. There are many patented and unpatented claims throughout the area. The OB site avoids the largest concentrations of claims. The mineral occurrence is associated with intrusive rocks. A

Table 4.3.1.4-2. Potential impact to known mining and mineral recovery activity in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT		NUMBER OF KNOWN CLAIMS		SHORT-TERM IMPACT[1,3]	LONG-TERM IMPACT[1,3]
NO.	NAME	UNPATENTED	PATENTED		
	Subunits with M-X Clusters and DTN				
4	Snake	169	—	No impact	No impact
5	Pine	406	—	Moderate	Moderate
6	White	500	7	Moderate	Moderate
7	Fish Springs	2,614	—	Moderate	Moderate
8	Dugway	1,766	—	Moderate	Moderate
9	Government Creek	115	—	No impact	No impact
46	Sevier Desert	1,795	2	Moderate	Moderate
46A	Sevier Desert & Dry Lake[2]	300	—	Moderate	Moderate
54	Wah Wah	43	2	Moderate	Moderate
137A	Big Smoky-Tonopah Flat	—	—	Moderate	Moderate
139	Kobeh	—	—	Moderate	Moderate
140A	Monitor—Northern	—	—	Moderate	Moderate
140B	Monitor—Southern	—	—	Moderate	Moderate
141	Ralston	—	—	Moderate	Moderate
142	Alkali Spring	—	—	No impact	No impact
148	Cactus Flat	—	—	No impact	No impact
149	Stone Cabin[2]	—	—	Moderate	Moderate
151	Antelope	—	—	Moderate	Moderate
154	Newark[2]	—	—	Moderate	Moderate
155A	Little Smoky—Northern	7	—	Moderate	Moderate
155B	Little Smoky—Southern	5	—	No impact	No impact
156	Hot Creek	149	1	Moderate	Moderate
170	Penoyer	91	1	Moderate	Moderate
171	Coal	331	—	Moderate	Moderate
172	Garden	86	—	No impact	No impact
173A	Railroad—Southern	5	—	No impact	No impact
173B	Railroad—Northern	69	—	Moderate	Moderate
174	Jakes	—	—	Moderate	Moderate
175	Long	—	—	Moderate	Moderate
178B	Butte—South	—	—	No impact	No impact
179	Steptoe	131	—	Moderate	Moderate
180	Cave	227	—	High	High
181	Dry Lake[2]	5	—	Moderate	Moderate
182	Delamar	13	17	Moderate	Moderate
183	Lake	479	167	Moderate	Moderate
184	Spring	43	20	Moderate	Moderate
196	Hamlin	11	—	Moderate	Moderate
202	Patterson	—	—	High	High
207	White River[2]	35	—	Low	Low
208	Pahroc	7	—	Low	Low
209	Pahranagat	—	—	Low	Low
	Overall DDA Impact			Moderate	Moderate

3917-1

[1]
- No impact.
- Low impact. Minor claim activity and low mineral potential of land withdrawn.
- Moderate impact. Moderate claim activity or location in potential mineralized belt.
- High impact. System located in area of heavy claim activity with high mineral potential previously recommended for exclusion.

[2]Conceptual location of Area Support Centers (ASCs).

[3]Impacts are caused by potential withdrawal of land presently held in mineral claims.

Table 4.3.1.4-3. Potential overall impact to known mining and mineral recovery activity which could result from construction of operating bases (OBs) for the Proposed Action and Alternatives 1-8.

HYDROLOGIC SUBUNIT OR COUNTY		NUMBER OF KNOWN CLAIMS (ALL UN-PATENTED)	ESTIMATED OVERALL IMPACT[1,2]				
			PROPOSED ACTION	ALT. 1	ALT. 2	ALT. 3	ALT. 4
NO.	NAME		COYOTE SPRING/ MILFORD	COYOTE SPRING/ BERYL	COYOTE SPRING/ DELTA	BERYL/ ELY	BERYL/ COYOTE SPRING
	Subunits or Counties within OB Suitability Area						
46	Sevier Desert	—					
46A	Sevier Desert & Dry Lake[3]	300					
50	Milford[3]	—					
52	Lund District	—					
53	Beryl-Enterprise	—					
179	Steptoe	131					
210	Coyote Spring	—					
219	Muddy River Springs	—					
	Curry County, NM	—					
	Hartley County, TX[3]	—					
	Overall Impact for OB						

HYDROLOGIC SUBUNIT OR COUNTY		NUMBER OF KNOWN CLAIMS (ALL UN-PATENTED)	ESTIMATED OVERALL IMPACT[1,2]			
			ALT. 5	ALT. 6	ALT. 7	ALT. 8
NO.	NAME		MILFORD/ ELY	MILFORD/ COYOTE SPRING	CLOVIS/ DALHART	COYOTE SPRING/ CLOVIS
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert	—				
46A	Sevier Desert & Dry Lake[3]	300				
50	Milford[3]	—				
52	Lund District	—				
53	Beryl-Enterprise	—				
179	Steptoe	131				
210	Coyote Spring	—				
219	Muddy River Springs	—				
	Curry County, NM	—				
	Hartley County, TX[3]	—				
	Overall Impact for OB					

3918-1

[1]

No impact.

Low impact. Minor claim activity and low mineral potential of land withdrawn.

Moderate impact. Moderate claim activity or location in potential mineralized belt.

High impact. System located in area of heavy claim activity with high mineral potential previously recommended for exclusion.

[2]Impacts are caused by potential withdrawal of land presently held in mineral claims.

[3]Conceptual location of Area Support Centers (ASCs).

geologic assessment of the area would be as required as part of Tier 2 decision-making to ensure that the OB site does not conflict with developable mineral deposits.

ALTERNATIVE 1 (4.3.1.4.3)

The DDA for Alternative 1 would be the same as that for the Proposed Action; there would be no difference in the impacts. The Coyote Spring Valley OB would be the same as that for the Proposed Action. The Delta OB would be located away from any active mining areas although there is a concentration of unpatented claims surrounding Sevier Lake to the south. The OB site would not be expected to disrupt any future mining activity.

ALTERNATIVE 2 (4.3.1.4.4)

The DDA for Alternative 2 would be the same as that for the Proposed Action. The Coyote Spring Valley OB would be the same as that for the Proposed Action. The Beryl OB site is not located near any active mining areas nor any concentration of mining claims. No significant impacts would be expected at this site.

ALTERNATIVE 3 (4.3.1.4.5)

The DDA for Alternative 3 would be the same as that for the Proposed Action and the impacts would be the same. The system in Railroad Valley could indirectly impact the Trap Springs oil field through temporary heavy construction traffic conflicts. The Beryl OB site is discussed under Alternative 1. The Ely OB site would be located south of the Ward mining district in southern Steptoe Valley. Some of the peripheral functions of the OB may conflict slightly with future expansion of the Ward District if mineral values are found beneath the valley alluvium. There exists some potential for additional discoveries in the mountains of the Egan Range and in the valley fill along the front of the range.

ALTERNATIVE 4 (4.3.1.4.6)

The DDA for Alternative 4 would be the same as that for the Proposed Action. The Beryl OB site is discussed under Alternative 1. The Coyote Spring Valley OB site is discussed under the Proposed Action.

ALTERNATIVE 5 (4.3.1.4.7)

The DDA for Alternative 5 is the same as that for the Proposed Action. The Milford OB site is discussed under the Proposed Action. The Ely OB site is discussed under Alternative 3.

ALTERNATIVE 6 (4.3.1.4.8)

The DDA for Alternative 6 would be the same as that for the Proposed Action. The Milford and the Coyote Spring Valley OB sites are discussed under the Proposed Action.

ALTERNATIVE 7 (4.3.1.4.9)

The DDA for Alternative 7 would be located on the surface of the High Plains in Texas and New Mexico. There is little mining activity in the area and no significant impacts would be expected. There may be some minor location conflicts with a new carbon dioxide gas field in Union and Harding counties but these should be avoidable. The Clovis OB site is not located near any mining or potential mining activity. No impacts other than an increased use of sand and gravel would be expected.

The Dalhart OB site is not located near any mining or potential mining activity. It is 15 to 20 mi west of the Hugoton gas field but no conflicts would be expected. The increased demand for sand and gravel would accompany the OB construction. See Table 4.3.1.4-4 for a comparison of impact potential by county.

ALTERNATIVE 8 (4.3.1.4.10)

The DDA for Alternative 8 would be split between Nevada/Utah and Texas/New Mexico. In Nevada/Utah, the reduced deployment would avoid the potential mineral areas to the west, around Tonopah, and to the north in White Pine County. The potential impacts to mining and mining claims would be substantially reduced. The ratings for the valleys retained in the layout are the same as for the Proposed Action. The Coyote Spring Valley OB would be the same as that for the Proposed Action. The Clovis OB would be the same as Alternative 7. Table 4.3.1.4-5 indicates the potential impact by hydrological subunit.

Table 4.3.1.4-4. Potential overall impact to known mining and mineral recovery activity in Texas/New Mexico DDA for Alternative 7.

COUNTY	NUMBER OF KNOWN CLAIMS		SHORT-TERM IMPACT[1,3]	LONG-TERM IMPACT[1,3]
	UNPATENTED	PATENTED		
Counties with M-X Clusters and DTN				
Bailey, TX	–	–	No impact	No impact
Castro, TX	–	–	No impact	No impact
Cochran, TX	–	–	No impact	No impact
Dallam, TX	–	–	No impact	No impact
Deaf Smith, TX[2]	–	–	No impact	No impact
Hartley, TX[2]	–	–	No impact	No impact
Hockley, TX	–	–	No impact	No impact
Lamb, TX	–	–	No impact	No impact
Oldham, TX	–	–	No impact	No impact
Parmer, TX	–	–	No impact	No impact
Randall, TX	–	–	No impact	No impact
Sherman, TX	–	–	No impact	No impact
Swisher, TX	–	–	No impact	No impact
Chaves, NM	–	–	No impact	No impact
Curry, NM	–	–	No impact	No impact
DeBaca, NM	–	–	No impact	No impact
Guadalupe, NM	–	–	No impact	No impact
Harding, NM	–	–	Low impact	Low impact
Lea, NM	–	–	No impact	No impact
Quay, NM	–	–	No impact	No impact
Roosevelt, NM[2]	–	–	No impact	No impact
Union, NM	–	–	Low impact	Low impact
Overall DDA Impact			No impact	No impact

3919-1

[1]
- No impact.
- Low impact. Minor claim activity and low mineral potential of land withdrawn.
- Moderate impact. Moderate claim activity or location in potential mineralized belt.
- High impact. System located in area of heavy claim activity with high mineral potential previously recommended for exclusion.

[2]Conceptual location of Area Support Centers (ASCs).

[3]Impacts are caused by potential withdrawal of land presently held in mineral claims.

Table 4.3.1.4-5. Potential overall impact to known mining and mineral recovery activity in Nevada/Utah and Texas/New Mexico DDAs for Alternative 8.

HYDROLOGIC UNIT OR COUNTY		NUMBER OF KNOWN CLAIMS		SHORT-TERM IMPACT[1,3]	LONG-TERM IMPACT[1,3]
NO.	NAME	UNPATENTED	PATENTED		
	Subunits or Counties with M-X Clusters and DTN				
4	Snake[2]	169	—	Low	Low
5	Pine	406	—	Moderate	Moderate
6	White	500	7	Moderate	Moderate
7	Fish Springs	2,614	—	Moderate	Moderate
46	Sevier Desert	1,795	2	Moderate	Moderate
46A	Sevier Desert & Dry Lake[2]	300	—	Moderate	Moderate
54	Wah Wah	43	2	Moderate	Moderate
155C	Little Smoky—Southern	5	—	Low	Low
156	Hot Creek	149	1	Moderate	Moderate
170	Penoyer	91	1	Moderate	Moderate
171	Coal[2]	331	—	Moderate	Moderate
172	Garden	86	—	Low	Low
173A	Railroad—Southern	5	—	Low	Low
173B	Railroad—Northern	69	—	Moderate	Moderate
180	Cave	227	—	High	High
181	Dry Lake[2]	5	—	Moderate	Moderate
182	Delamar	13	17	Moderate	Moderate
183	Lake	479	167	Moderate	Moderate
184	Spring	43	20	Moderate	Moderate
196	Hamlin	11	—	Moderate	Moderate
202	Patterson	—	—	High	High
207	White River	35	—	Low	Low
	Bailey, TX	—	—	No impact	No impact
	Cochran, TX	—	—	No impact	No impact
	Dallam, TX	—	—	No impact	No impact
	Deaf Smith, TX	—	—	No impact	No impact
	Hartley, TX	—	—	No impact	No impact
	Hockley, TX	—	—	No impact	No impact
	Lamb, TX	—	—	No impact	No impact
	Oldham, TX	—	—	No impact	No impact
	Parmer, TX	—	—	No impact	No impact
	Chaves, NM	—	—	No impact	No impact
	Curry, NM	—	—	No impact	No impact
	DeBaca, NM	—	—	No impact	No impact
	Guadalupe, NM	—	—	No impact	No impact
	Harding, NM	—	—	Low	Low
	Lea, NM	—	—	No impact	No impact
	Quay, NM[2]	—	—	No impact	No impact
	Roosevelt, NM[2]	—	—	No impact	No impact
	Union, NM	—	—	Low	Low

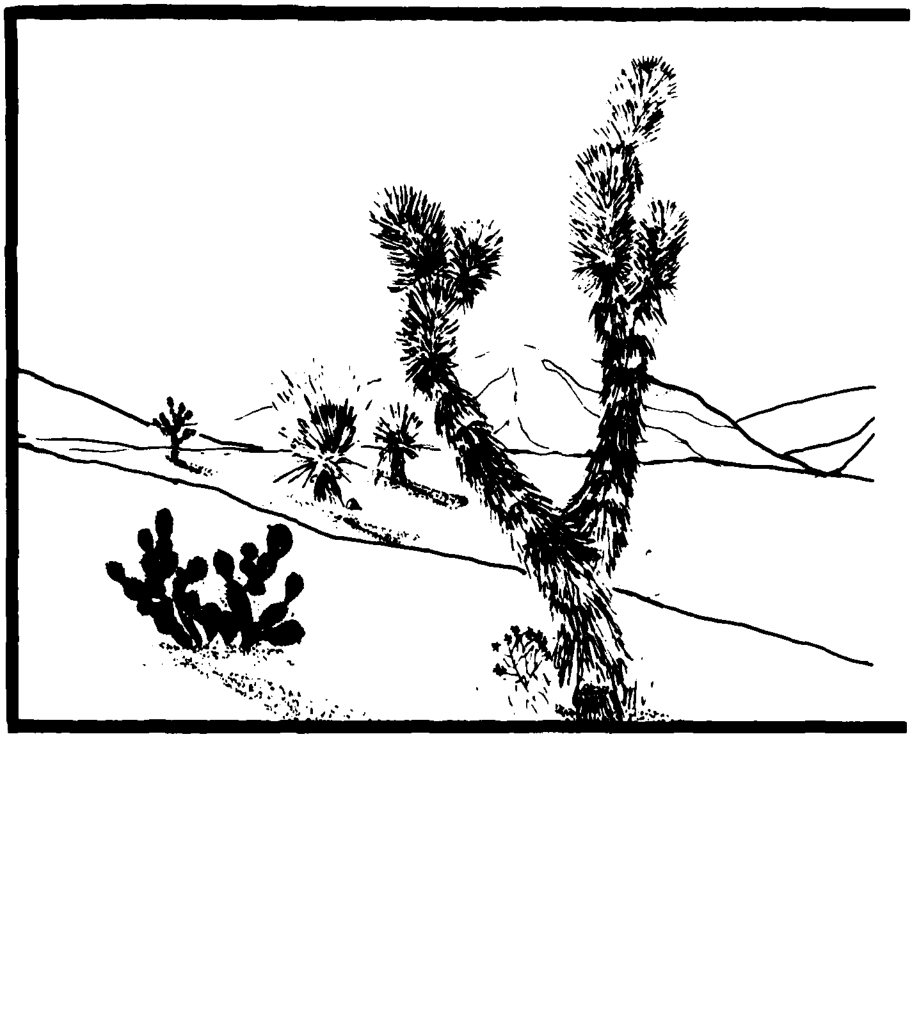
3920-1

[1]
- No impact.
- Low impact. Minor claim activity and low mineral potential of land withdrawn.
- Moderate impact. Moderate claim activity or location in potential mineralized belt.
- High impact. System located in area of heavy claim activity with high mineral potential previously recommended for exclusion.

[2]Conceptual location of Area Support Centers (ASCs).

[3]Impacts are caused by potential withdrawal of land presently held in mineral claims.

Native Vegetation



NATIVE VEGETATION

INTRODUCTION (4.3.1.5.1)

The native vegetation in the study area forms the base of a diverse community of plants and animals, coadapted to harsh environments. Thousands of years of adaption to the harsh climatic and soil conditions have made native vegetation the most stable vegetative cover available. Few nonnative species (particularly in portions of the Nevada/Utah project area) possessing the beneficial attributes of the native vegetation can be established in these areas. The existing native vegetation has many functional attributes. It is at the base of the food chain, provides a habitat for wildlife, and is the basic resource of the livestock industry. Vegetation protects the soil from erosion, minimizes sediment discharge from wind and water erosion, and greatly reduces the occurrence and magnitude of floods. Vegetation also aids percolation of precipitation to groundwater storage, builds desirable soil characteristics, and provides for an aesthetic environment for recreation.

Once the native vegetation is removed, natural recovery is projected to take from a few decades to over a century. Plants and animals that currently dominate will be replaced by species which thrive in disturbed areas. Where vegetative cover is removed and the soil disturbed, substantial rehabilitation measures are required to restore the vegetation and wildlife habitat and the other functional attributes of vegetative cover.

Vegetation types in the Nevada/Utah study area are relatively uniform over wide areas, but there is substantial local differentiation. For example, sagebrush vegetation may be dominated by one or more of five species or subspecies, each which exhibit substantial variation, depending on geographic location and site characteristics. In addition, the group of species associated with the dominant species also changes markedly from place to place. Existing within areas which support widespread vegetation types are many unique kinds of vegetation, such as relict populations and species hybridizations, and possibly undiscovered species or subspecies.

The impact to natural vegetation was predicted by comparing the project layout to the known distribution of vegetation types in the area. The data base for

vegetation distribution included Bureau of Land Management and Soil Conservation Service vegetation maps, LANDSAT vegetation mapping, field studies conducted for this report, and vegetation distributions presented in the literature. The potential for secondary effects to vegetation was determined using information from past studies of areas where large-scale vegetation removal has occurred.

PROPOSED ACTION (4.3.1.5.2)

DDA Impacts

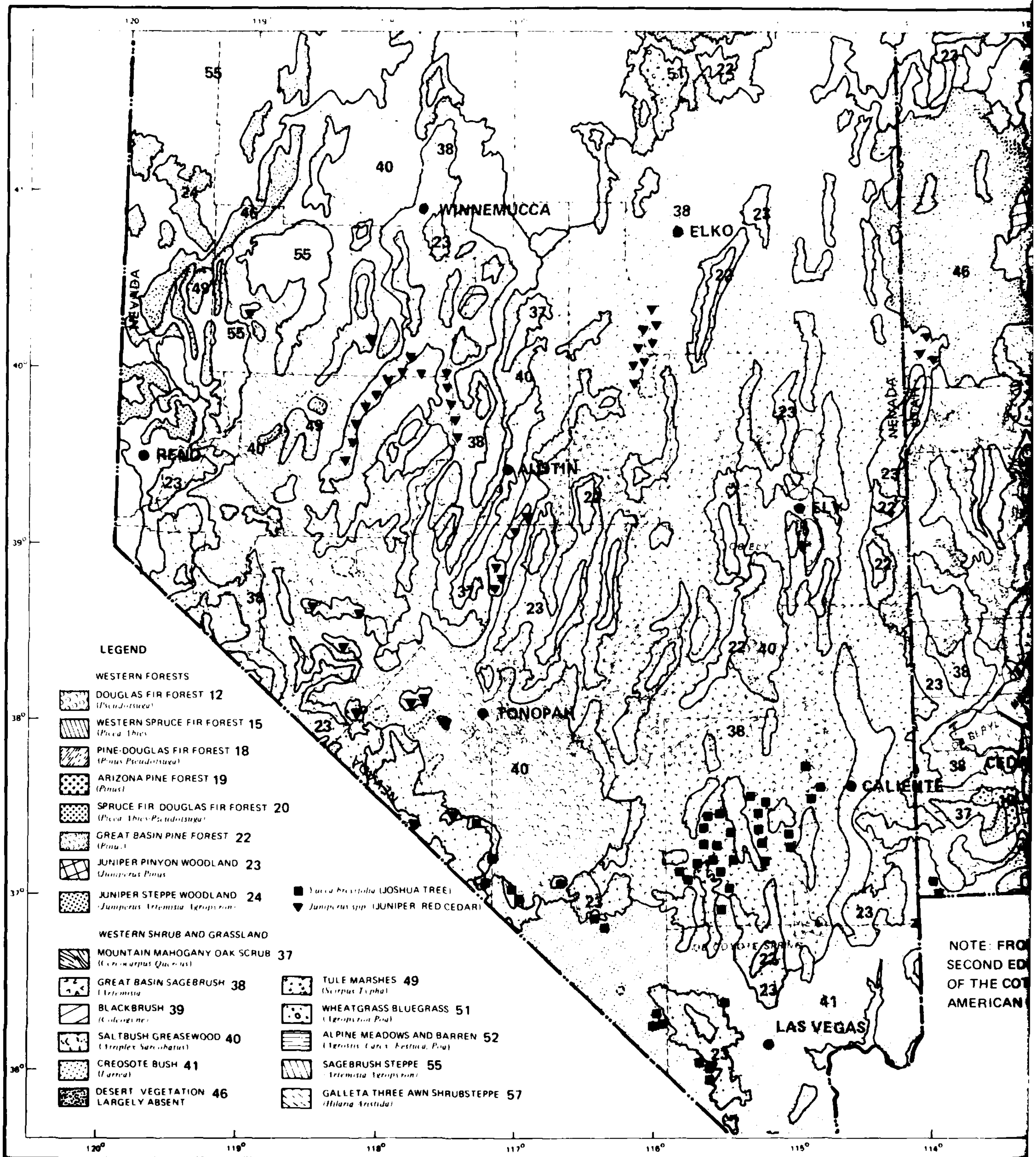
Approximately 160,000 acres of vegetation would be removed for roads, shelters, and other structures. Additional acreage would be removed for construction roads, material borrow sites, and other project elements. Shadscale, Great Basin sagebrush, and pinyon-juniper woodland, which cover most of the bajadas and valley bottoms in the proposed DDA, are likely to be the vegetation types most affected. Other bajada and valley bottom vegetation types, including alkali sink scrub, desert marsh and spring vegetation, riparian woodland, creosote bush scrub and wash and arroyo vegetation would also be affected by direct clearing. A simplified vegetation type map for the proposed project area with the full deployment project layout is shown in Figure 4.3.1.5-1.

Secondary effects to vegetation would result from accelerated wind and water erosion, sedimentation, soil compaction, deposition of excavated material, altered surface water flow patterns, groundwater drawdown and increased fugitive dust. The most significant of these effects are likely to be localized near cleared areas. However, the large number of potentially cleared locations within many hydrologic subunits will result in the potential for extensive effects. Since secondary effects to vegetation are related to site-specific factors, such as slope, the total area which will be impacted cannot be determined with precision until detailed siting has been performed.

The spread of weedy species will occur when vegetation is disturbed or removed. One alien annual, halogeton (Halogeton glomeratus), is of particular concern because it is poisonous to livestock and has reduced or eliminated grazing in some areas in the Great Basin. Halogeton becomes quickly established after disturbance. The reestablishment of perennial vegetation is thought to be the only effective method of control of this species. After light disturbance, halogeton may be gradually replaced through competition with native shrubs. Under severe or repeated disturbance, halogeton may alter soil chemistry to the point that native vegetation is excluded. Soil modification by halogeton may prevent native species reestablishment for over 50 years.

The amount of area cleared of vegetation would increase throughout the construction phase. Additional areas will be disturbed for some time beyond the construction phase, as a result of off-road vehicle use and erosion.

Cleared areas which are not used for roads or structures will have the potential for being slowly revegetated. The rate of natural revegetation is dependent upon such factors as the annual rate and seasonal distribution of precipitation, the substrate characteristics, the intensity of erosive forces and the response of reestablishing species to disturbed conditions. Natural revegetation will


WINNEMUCCA
ELKO
RENO
AUSTIN
ELY
TONOPAH
CALIENTE
LAS VEGAS
NEVADA
LEGEND
WESTERN FORESTS
DOUGLAS FIR FOREST 12
WESTERN SPRUCE FIR FOREST 15
PINE-DOUGLAS FIR FOREST 18
ARIZONA PINE FOREST 19
SPRUCE FIR DOUGLAS FIR FOREST 20
GREAT BASIN PINE FOREST 22
JUNIPER PINYON WOODLAND 23
JUNIPER STEPPE WOODLAND 24
WESTERN SHRUB AND GRASSLAND
MOUNTAIN MAHOGANY OAK SCRUB 37
GREAT BASIN SAGEBRUSH 38
BLACKBRUSH 39
SALTBUSH GREASEWOOD 40
CREOSOTE BUSH 41
DESERT VEGETATION LARGELY ABSENT 46
TULE MARSHES 49
WHEATGRASS BLUEGRASS 51
ALPINE MEADOWS AND BARREN 52
SAGEBRUSH STEPPE 55
GALLETA THREE AWN SHRUBSTEPPE 57
(JOSHUA TREE)
(JUNIPER RED CEDAR)
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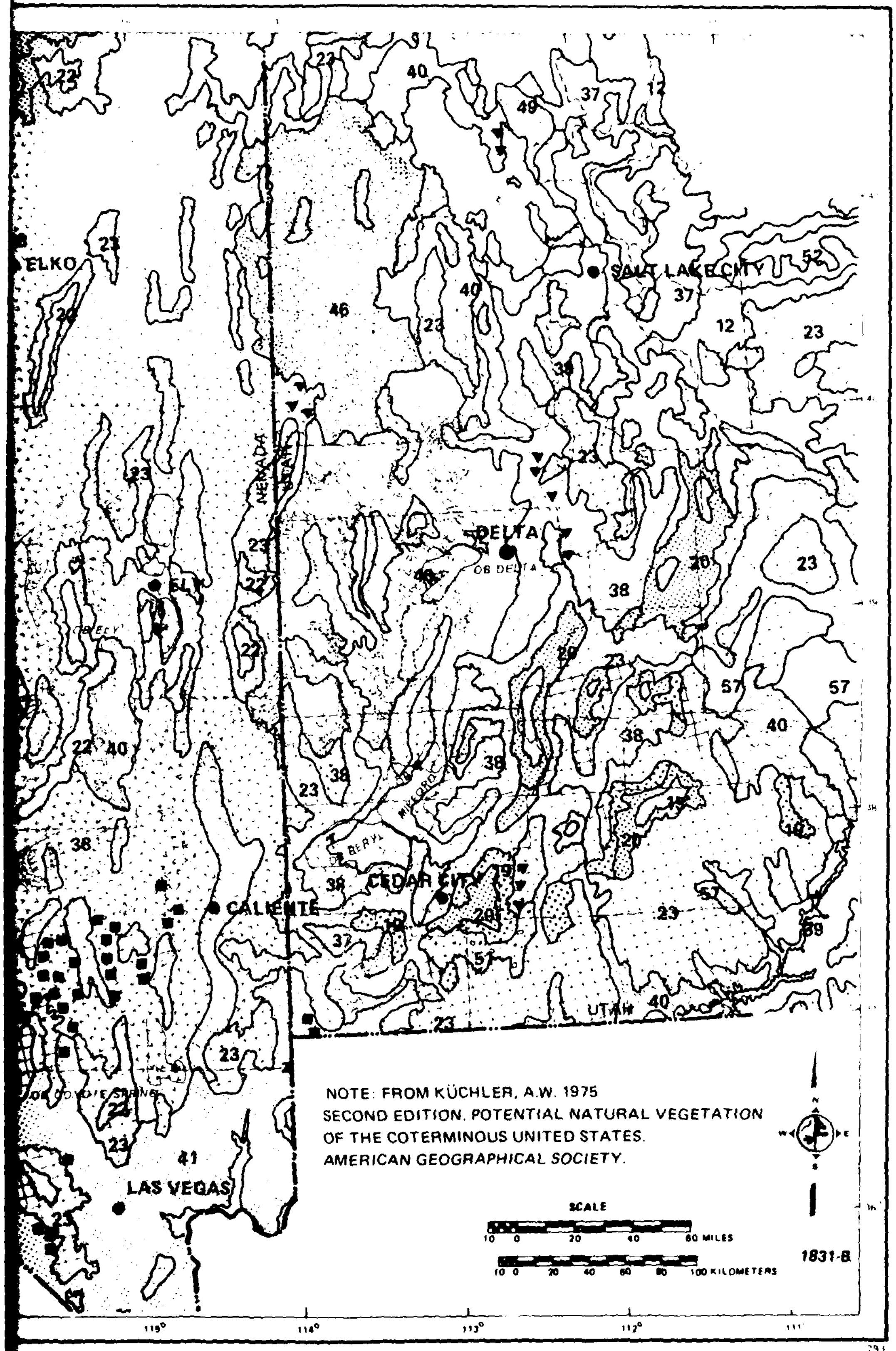

Figure 4.3.1.5-1. Simplified vegetation type map and the proposed action conceptual layout.

be inhibited if the soil has been compacted, covered with overburden materials unsuitable for plant growth, or if the surface soil is removed, exposing toxic subsoil, hard soil layers or bedrock.

The time required for the vegetation to recover from disturbance is expected to be very long. Complete recovery may take a century or more. The clearing of vegetation would accelerate the spread of halogeton, a trend that could be irreversible. Long-term establishment of halogeton could prevent reestablishment of native vegetation, and irretrievably degrade the value of the vegetation for future wildlife and livestock use.

Construction and operation of the system would reduce the usefulness of the cleared and surrounding areas for livestock forage, wildlife habitat, and recreation. Many individuals of common animal species which rely on the vegetation would be lost. Although cleared areas would be less than 2 percent of any hydrologic subunit, these areas will be subject to erosion, an impact which is particularly critical when dust, sediment, and flooding impact nearby streams or rivers, farming operations or population centers.

The large number of cleared areas in many of the affected hydrologic subunits would result in a greater impact than would occur from the clearing of only a few areas. The opportunity for viewing undisturbed areas would be limited in watersheds with many clusters. The more disturbed area, the larger the amount of vegetation lying around the perimeter of the cleared areas which will be subject to erosion and flooding. These areas would be subject to invasion by toxic weeds which would make livestock avoidance more difficult. The proportion of the watershed which lies within 0.5 mi of a disturbance provides a rough index to the frequency of vegetation clearing and the associated secondary impacts. Based on planimetry from 1:250,000 scale maps of the project layout, it was determined that three hydrologic subunits would have over 50 percent of their area within 0.5 mi of disturbance, and an additional 18 hydrologic subunits would have over 25 percent of their area within 0.5 mi of disturbance. If five clusters are sited in the Alkali Spring hydrologic subunit as shown on the conceptual layout, 59 percent of the valley area would lie within 0.5 mi of where vegetation had been removed.

Table 4.3.1.5-1 lists the directly impacted hydrologic subunits and the amount and principal types of native vegetation which would be removed.

The clearance of vegetation is unavoidable if the system is to be constructed. However, the cleared area can be kept to a minimum, and much of the adverse impacts associated with vegetation clearance can be avoided or reduced in duration through the mitigation measures discussed below. Without mitigation, the significant adverse impacts from vegetation clearing would range from long-term to permanent.

The extent of vegetation clearing would be minimized by consolidation of transportation and communication networks, avoiding the installation of over-sized surface water diversion structures, and by reducing the need for off-road security and maintenance vehicles. By confining of vehicles to designated corridors and by minimizing the area disturbed for construction purposes, the total area disturbed would be reduced. The Air Force has been successful in confining construction to designated corridors, as at the Luke-Yuma construction test site. However, a

Table 4.3.1.5-1. Potential impact to native vegetation in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6, and 8.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	TOTAL HYDROLOGIC SUBUNIT AREA (ACRES)	POTENTIAL NATIVE VEGETATION REMOVED (ACRES)[5]	INDEX TO OFF-SITE DISTURBANCE[6] (IOSD)	SHORT- AND LONG-TERM IMPACT[1]
	Subunits with M-X Clusters and DTN				
4	Snake[2,4]	1,728,000	10,800	23	
5	Pine[2]	467,200	4,100	28	
6	White[2]	601,600	4,900	32	
7	Fish Springs[2]	256,000	2,100	33	
8	Dugway	207,200	2,000	37	
9	Government Creek	362,400	600	8	
46	Sevier Desert[2]	1,920,000	5,800	14	
46A	Sevier Desert & Dry Lake[2,3]	620,800	8,100	24	
54	Wah Wah[2]	384,000	5,800	51	
137A	Big Smoky-Tonopah Flat	1,025,900	3,300	22	
139	Kobeh	555,500	5,000	38	
140	Monitor N & S	664,300	4,000	20	
141	Ralston	586,900	6,400	38	
142	Alkali Spring	200,300	3,300	59	
148	Cactus Flat	see Stone Cabin		—	—
149	Stone Cabin[3]	630,400	4,600	28	
151	Antelope	284,200	4,400	44	
154	Newark	512,600	2,400	33	
155	Little Smoky N & S[2]	741,100	5,000	11	
156	Hot Creek[2]	663,000	4,700	28	
170	Penoyer[2]	448,000	3,900	29	
171	Coal[2,4]	294,400	3,800	43	
172	Garden[2]	315,500	3,400	40	
173	Railroad N & S[2]	1,716,300	11,100	20	
174	Jakes	270,100	3,100	35	
175	Long	416,600	1,300	2	
178B	Butte—South	646,400	3,400	18	
179	Steptoe	1,242,900	500	1	
180	Cave[2]	231,700	2,000	28	
181	Dry Lake[2,3]	564,500	6,800	42	
182	Delamar[2]	245,100	2,000	36	
183	Lake[2]	369,300	3,100	35	
184	Spring[2]	1,063,000	1,400	5	
196	Hamlin[2]	264,300	4,100	56	
202	Patterson[2]	266,200	600	15	
207	White River[2,3]	1,036,800	4,200	17	
208	Pahroc	305,900	300	7	
209	Pahranagat	503,000	600	4	
	Overall DDA	27,781,200	142,900	5	
	Overall DDA for Alternative 8	14,196,800	73,100	5	

3874-2

[1] No impact. (No vegetation removed.)

Low impact. (Less than 1,000 acres vegetation removed and an IOSD of 15 or less.)

Moderate impact. (1,000-5,000 acres of vegetation removed and an IOSD between 15 and 35 percent.)

High impact. (Over 5,000 acres vegetation removed and an IOSD over 35.)

[2]Affected hydrologic subunits under Alternative 8.

[3]Conceptual location of Area Support Centers (ASCs) for the Proposed Action and Alternatives 1-6.

[4]Conceptual location of Area Support Centers (ASCs) for Alternative 8.

[5]Includes area for DTN, cluster roads, shelters, construction camps and concrete plants.

[6]Index to off-site disturbance equals the percent of the hydrologic subunit within 0.5 miles of disturbance.

corresponding degree of success will probably be unlikely, due to the magnitude of the project.

Those areas which were cleared or otherwise disturbed, and not used for roads or other facilities, have the potential for being revegetated. Implementing the following components of a revegetation plan, selected on a site-specific basis, would greatly accelerate vegetation recovery, erosion control, and a return of the disturbed land to current use.

- o Reapply surface soil when exposed sub-soil is of lower quality. Quality surface soils should be removed from where roads and structures are to be constructed and then applied to revegetation areas.

- o Produce a final surface configuration, providing for stable slopes, minimizing runoff and erosion, and increasing water retention.

- o Apply and secure mulch (i.e., straw, gravel) for erosion control, water retention, and soil temperature moderation.

- o Plant suitable vegetation where precipitation is greater than 6 inches annually, or where irrigation is used, to provide wildlife habitat, erosion control, and livestock forage. In non-irrigated areas receiving 6 to 8 in. of precipitation annually, the success of seeding efforts is expected to be very limited.

- o Irrigate planted areas which receive less than 8 inches of precipitation annually, during the critical plant establishment period. Due to the limited water availability within the project area, irrigation priority should be given to large cleared patches (i.e., shelter locations), to steep cut or filled slopes and highly erodible soils, and to disturbed areas near population centers. Planting efforts usually fail in areas which receive less than 8 inches of precipitation annually (which includes roughly 80 percent of the projected disturbed area), unless irrigation is used. Revegetation water is not included in water estimates presented in this report and would increase requirements significantly, although this could be partially offset by reuse of water when possible.

- o Minimize repeated disturbance of planted areas (from livestock and ORV activity), until vegetation is adequately reestablished.

- o Implement a post construction monitoring program and treat areas requiring additional erosion control, seeding or transplanting, or vegetation management.

These procedures would help minimize or avoid the permanent establishment of toxic weeds. Although cleared areas would be out of production for an initial period while vegetation is reestablishing, erosion control and the return of wildlife habitat would be taking place. A comprehensive revegetation program would be very expensive.

Coyote Spring Valley OB Impacts

The Coyote Spring OB would result in the permanent removal of approximately 7,000 acres of native vegetation, mainly creosote bush scrub and joshua tree woodland, with some desert marsh and spring vegetation, and wash and arroyo vegetation (see Figure 4.3.1.5-2). Additional areas may also be cleared as a consequence of construction activity. At the present time, the vegetation of Coyote Spring Valley is relatively undisturbed. Peak impacts to native vegetation from the M-X project would occur near the close of the construction period. Indirect impacts are expected to continue to increase somewhat throughout project life.

Recovery of the vegetation in areas that are not permanently covered may commence at the end of construction, provided that soil conditions and water availability are suitable for plant growth. Recovery rates for creosate bush scrub are slow, although they have not been precisely determined. A study on the recovery of this community in the northern Mojave Desert showed that 33 years after disturbance, 20 percent of the shrub species had reached predisturbance levels of density and frequency. This study and others suggest that substantial vegetation recovery will not occur within the lifetime of the M-X project. Complete recovery is likely to require a minimum of 100 years.

Indirect impacts would include degradation of vegetation, mainly creosote bush scrub, joshua tree woodland, some desert marsh and spring vegetation, and wash and arroyo vegetation, as a result of the effects of fugitive dust, groundwater drawdown, increased collection of certain plant species for commercial purposes, and increased ORV and other recreational usage. The area of vegetation that may be lost or degraded from these activities could be significant. The indirect impacts from recreational activities of the M-X related population are expected to extend to surrounding areas. These indirect impacts in are expected to be concentrated in Pahranagat, Meadow Valley Wash, Las Vegas, Lower Moapa, Virgin River, Black Mountains, and California Wash hydrologic subunits.

The impacts will not vary greatly if the location of the base is shifted within the suitability zone. However, the proportion of each vegetation type affected may change, and this could cause significant differences in impacts to moisture-requiring vegetation types, including desert marsh and spring vegetation, and wash and arroyo vegetation.

Additional impacts to Coyote Spring Valley and nearby hydrologic subunits may result from construction and operation of the Allen-Warner Valley Energy System in Garnet Valley, approximately 10 mi southeast of the proposed operating base site. Personnel from that project would be expected to carry out some recreational activities in Coyote Spring Valley and nearby hydrologic subunits, resulting in indirect impacts similar to those discussed for M-X.

The direct and indirect loss of native vegetation during the construction and operations phases of the project are unavoidable. The amount lost could be reduced by mitigation measures comparable to those discussed for DDA impacts.

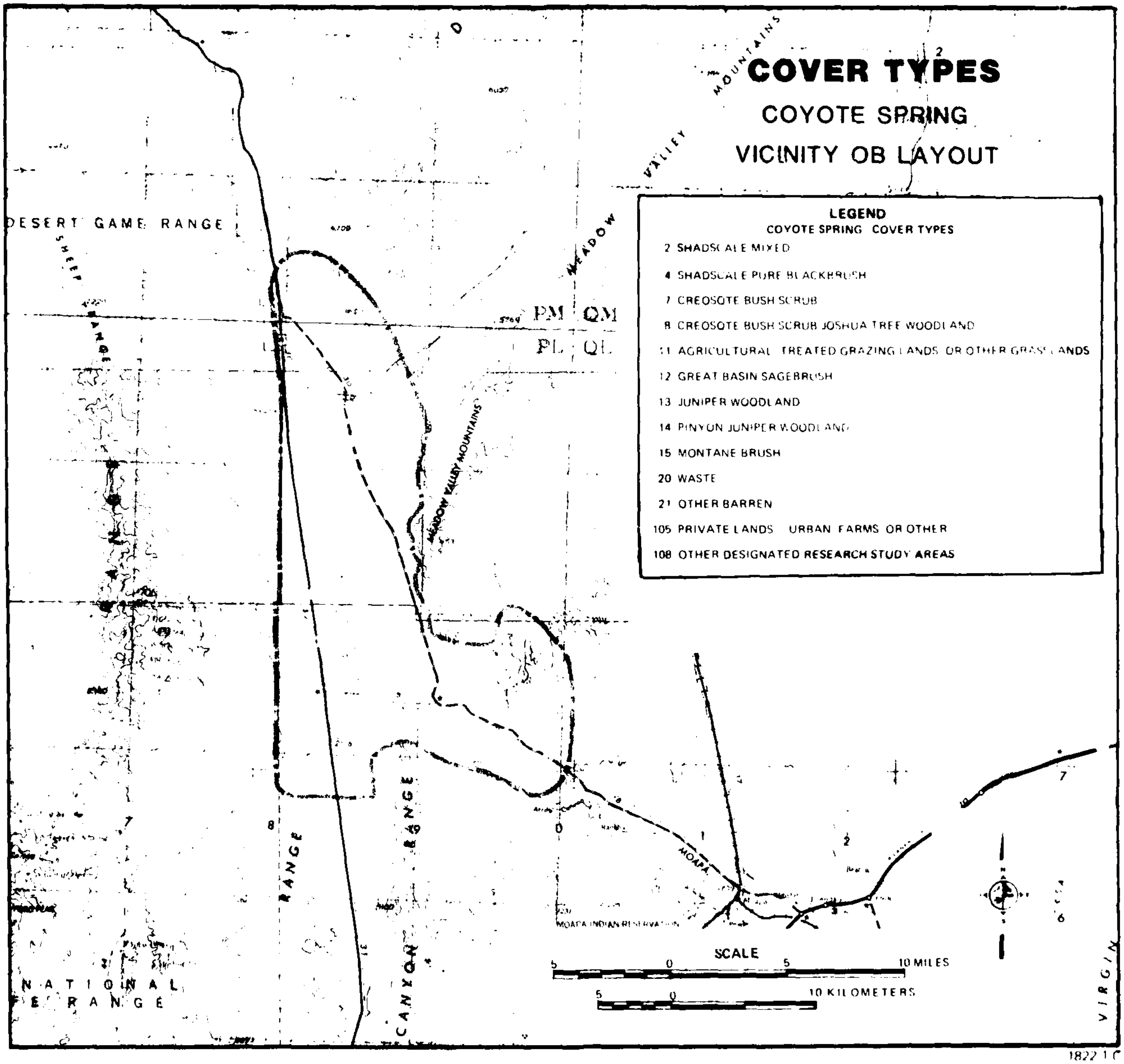

Figure 4.3.1.5-2. Vegetation cover types in the vicinity of Coyote Spring.

Milford OB Impacts

Siting of a second OB near Milford would result in the direct removal of approximately 5,000 to 5,500 acres of native vegetation, mainly Great Basin sagebrush, shadscale scrub, and alkali sink scrub. Additional acreage of vegetation would also be removed as a result of clearing for drainage diversion, construction marshalling, borrow pit sites, and so forth.

Indirect impacts resulting from recreational activities of the M-X related population are expected to extend to surrounding hydrologic subunits with greatest concentration in the Pine, Beaver, Sevier Desert, Parowan, and Beryl-Enterprise District hydrologic subunits, and in the area south of the Beryl-Enterprise District. Indirect impacts will include loss or degradation of Great Basin sagebrush, shadscale scrub, alkali sink scrub, and possibly pinyon-juniper woodland and other vegetation types (Figure 4.3.1.5-3). Another potentially significant adverse impact is the invasion of halogeton (Halogeton glomeratus). Additional indirect impacts to the Milford area and other nearby watersheds may result from an alunite plant about 30 mi southwest of Milford. Construction and operation of the mine and processing plant would result in increased air pollution, and varying degrees of damage to soil, vegetation, and land productivity.

The native vegetation of the Milford area has been affected by livestock grazing and recreational activities. The impacts to vegetation from M-X would not vary greatly if the location of the base is shifted within the suitability zone. However, the proportion of each vegetation type affected may change. For vegetation types of limited occurrence, such as riparian woodland, the amount removed could vary greatly, depending upon the base location selected.

The peak impact to vegetation would occur near the close of the construction period, although some additional impacts are expected after this period. The long-term and irretrievable loss of native vegetation would be as discussed for the Coyote Spring site.

The direct and indirect loss of native vegetation during the construction and operations phase of the project is unavoidable. The amount of vegetation removed could be reduced by the use of mitigation measures discussed for the DDA.

ALTERNATIVE 1 (4.3.1.5.3)

Impacts in the DDA and at the Coyote Spring OB would be the same as those for the Proposed Action. The second OB near Beryl would result in the direct removal of approximately 5,000-5,500 acres of native vegetation, mainly Great Basin sagebrush, shadscale scrub, alkali sink scrub, and pinyon-juniper woodland (see Figure 4.3.1.5-4). The amount of native vegetation that would be permanently lost at Beryl is similar to that lost at Milford, although the proportion of each native vegetation type lost would differ between the two sites.

Indirect impacts resulting from recreational activities of the M-X related population are expected to extend to Pine, Cedar City, Parowan, Spring, and Eagle hydrologic subunits and the area south of the Beryl-Enterprise District.

The impacts will not vary greatly if the location of the base is shifted within the suitability zone. The proportion of each vegetation type affected may change.

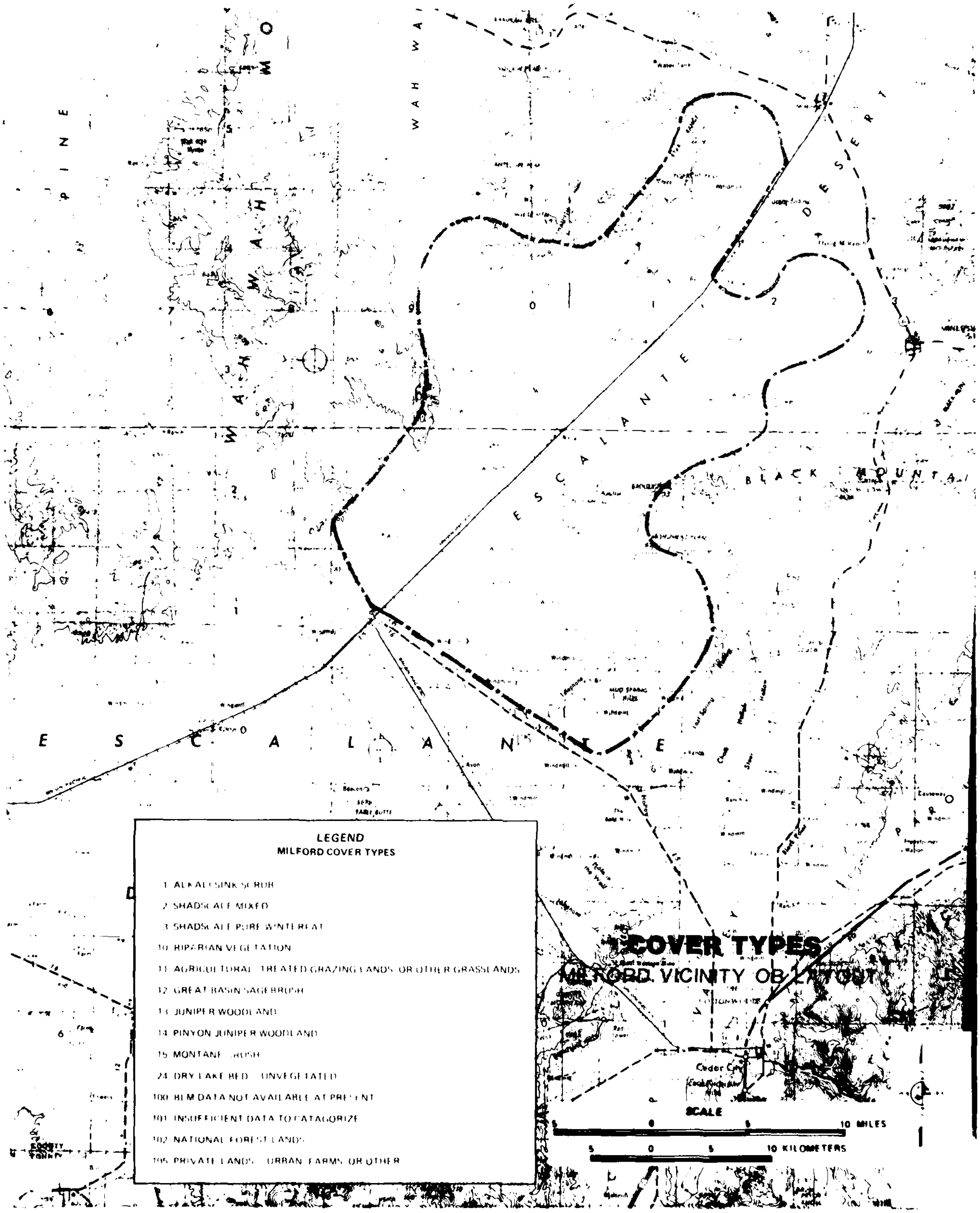

Figure 4.3.1.5-3. Vegetation cover types in the vicinity of Milford.

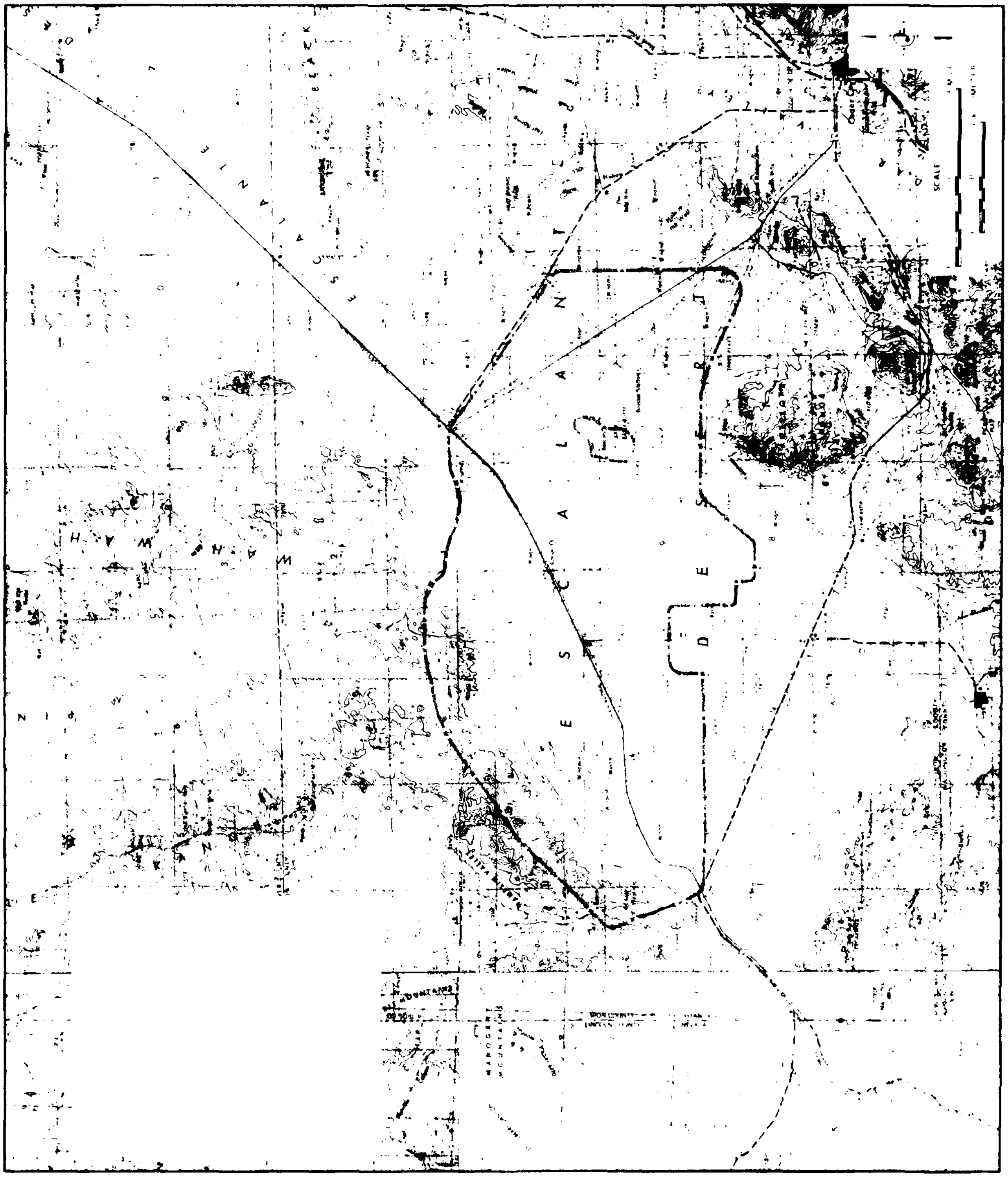

Figure 4.3.1.5-4. Vegetation types in the vicinity of Beryl.

For vegetation types of limited area, such as pure winterfat stands, the amount lost within the suitability zone could vary greatly, depending on the location selected.

ALTERNATIVE 2 (4.3.1.5.4)

Impacts in the DDA and at the Coyote Spring OB would be the same as those for the Proposed Action. The second OB near Delta would result in the direct removal of approximately 5,000-5,500 acres of native vegetation, mainly shadscale scrub and some alkali sink scrub (Figure 4.3.1.5-5). This impact is not significantly different from that expected from the Milford OB. Temporary and indirect impacts are also expected to be similar to those of the Proposed Action. The loss of shadscale scrub may be greater at Delta than at Milford, since larger areas of this vegetation type are found at Delta.

Indirect impacts resulting from recreational activities of the M-X-related population are expected to be concentrated in Beaver, Fish Springs, Government Creek, and Rush hydrologic subunits, and in the area east of the Sevier Desert. The impacts will not vary greatly if the location of the base is shifted within the suitability zone.

Additional impacts to the native vegetation of the Delta area and other nearby watersheds may result from IPP construction near Lynndyl, 15 mi northeast of Delta. Impacts to vegetation from this project include permanent removal of 2,650 acres and temporary removal of an addditional 8,320 acreas of vegetation. Indirect impacts to vegetation are also expected from the IPP project.

The changes in impacts over time, the long-term and irretrievable losses of native vegetation, the significance of the impacts and potential mitigation measures are expected to be similar to those discussed for the Milford OB under the Proposed Action.

ALTERNATIVE 3 (4.3.1.5.5)

Impacts in the DDA would be the same as those for the Proposed Action. The Beryl OB would have the same impacts as those discussed under Alternative 1, except that an additional 2,000 acres of vegetation would be removed. In addition, indirect impacts would be greater, since there will be a larger M-X-related population at a first base than at a second base.

Siting the second OB near Ely would result in the direct removal of approximately 5,000-5,500 acres of native vegetation, mainly Great Basin sagebrush and pinyon-juniper woodland (Figure 4.3.1.5-6). This impact is not significantly different from that expected as a result of siting a second operating base near Milford under the Proposed Action. Temporary and indirect impacts to vegetation are expected to be similar to those of the Proposed Action.

Indirect impacts resulting from recreational activities of the M-X-related population are expected to be concentrated in Spring, White River, Ruby, Jakes, and Snake hydrologic subunits. The impacts would not vary greatly as the location of the base was shifted within the suitability zone.

Additional impacts to the native vegetation of the Ely area and nearby hydrologic subunits are expected from the planned reopening of the Kennecott

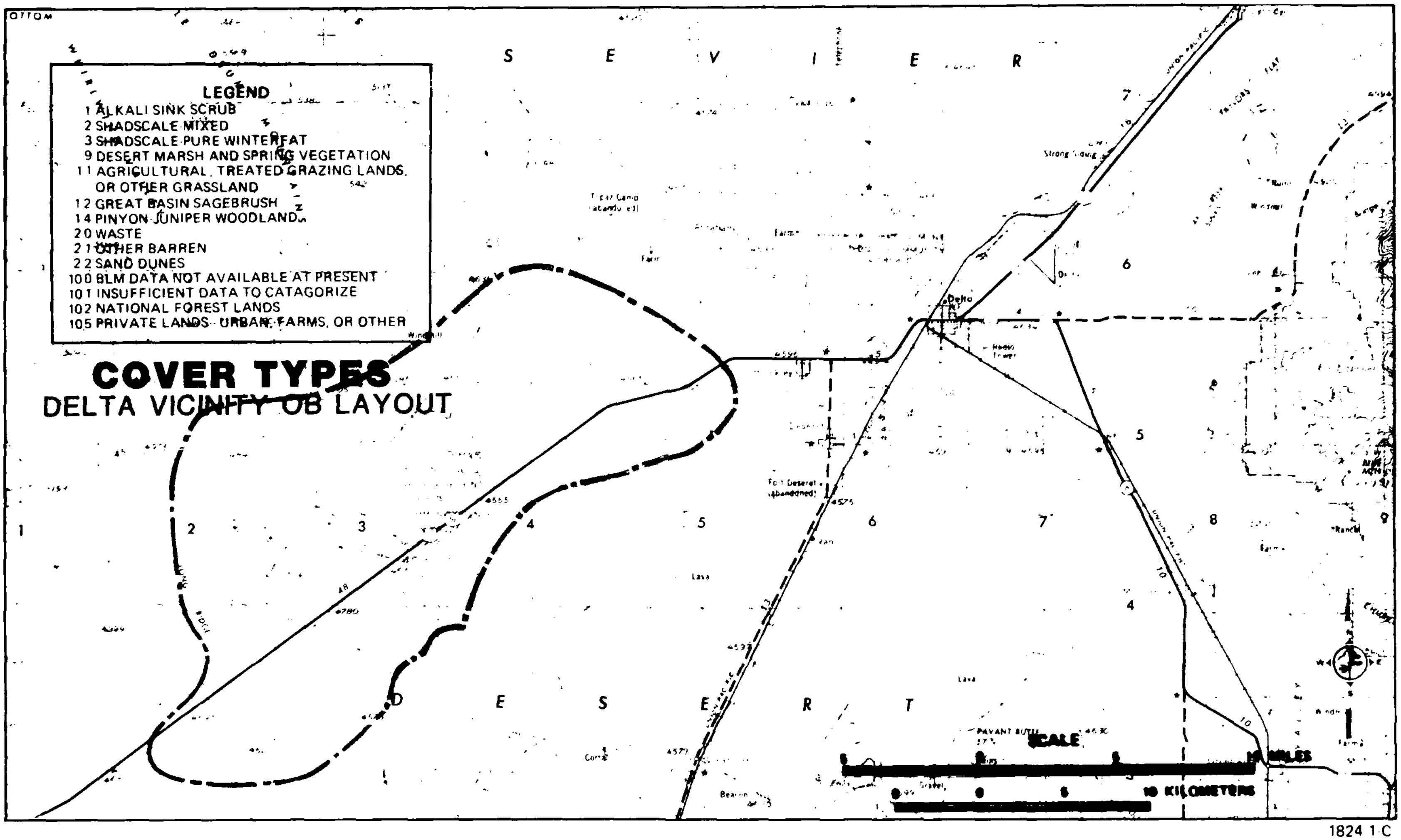

Figure 4.3.1.5-5. Vegetation cover types in the vicinity of Delta.

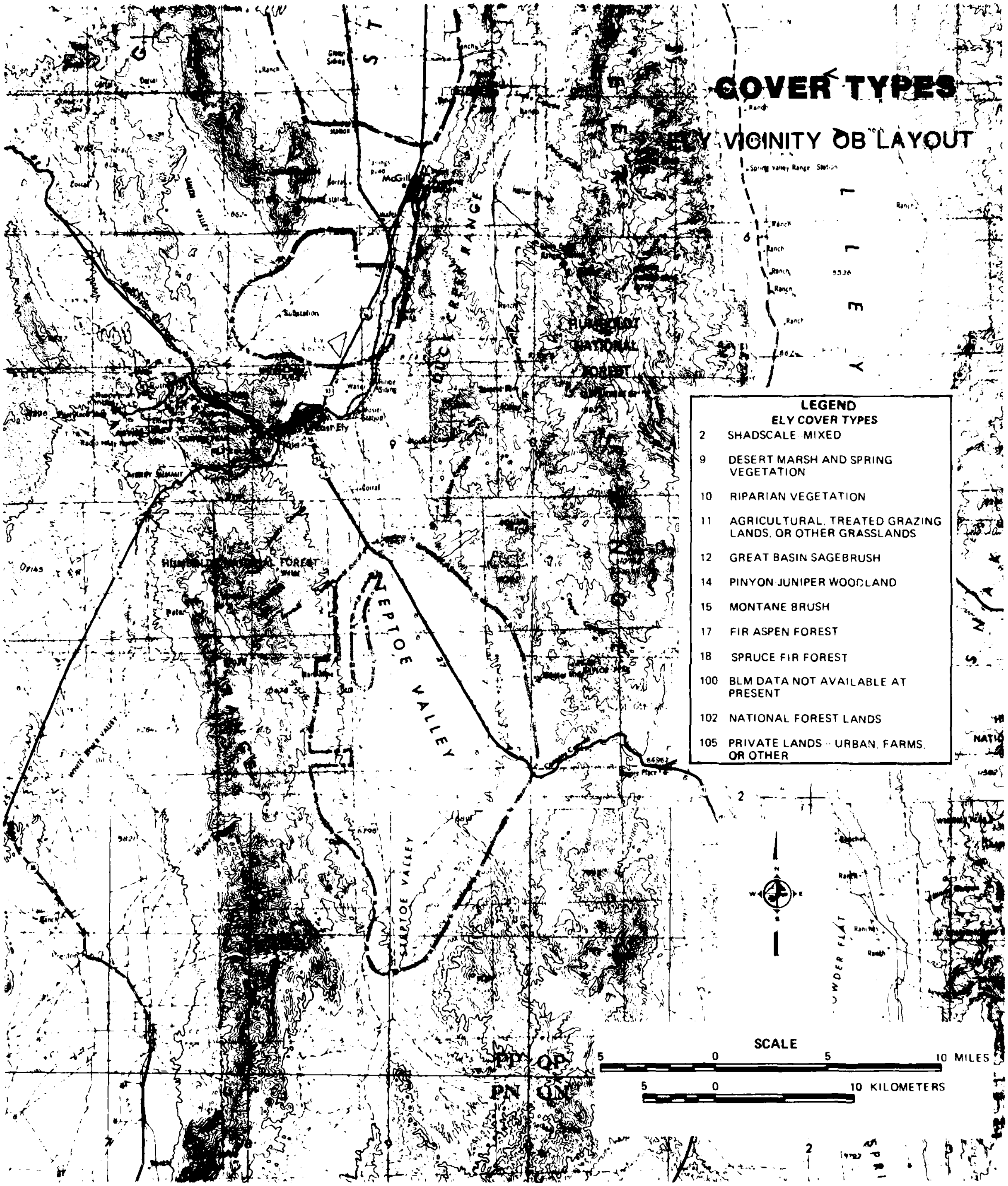

Figure 4.3.1.5-6. Vegetation cover types in vicinity of Ely.

Copper Mine, north of Ely, and the construction and operation of the White Pine County Power Plant. Expected impacts on vegetation from the reopening of the Kennecott Copper Mine include those resulting from increased local population level. Potential sites for the White Pine County Power Plant include one in Jakes Valley, west of Ely, and another one near McGill in northern Steptoe Valley. Both are near the proposed OB site south of Ely. White Pine Power is expected to result in some permanent loss of native vegetation, and additional indirect impacts. The change in impact over time, the long-term and irretrievable losses of native vegetation, the significance of the impacts and the potential mitigations are similar to those discussed for the second base of the Proposed Action.

ALTERNATIVE 4 (4.3.15.6)

Impacts in the DDA would be the same as for the Proposed Action, and impacts at the Beryl OB would be the same as those for Alternative 3. Impacts at the Coyote Spring OB would be similar to those discussed under the Proposed Action, except 2,000 fewer acres of vegetation would be removed, and indirect impacts would be less extensive.

ALTERNATIVE 5 (4.3.15.7)

Impacts in the DDA would be the same as those for the Proposed Action. Impacts at the Milford OB would be similar to those discussed for the Proposed Action, except approximately 2,000 more acres of native vegetation would be removed. Indirect impacts would be greater, since there would be more people. Impacts at the Ely OB would be the same as those for Alternative 4.

ALTERNATIVE 6 (4.3.15.8)

Impacts in the DDA would be the same as those for the Proposed Action, and impacts at the Milford OB would be the same as those for Alternative 5. Impacts at the Coyote Spring OB would be the same as those for Alternative 4.

ALTERNATIVE 7 (4.3.15.9)

Full deployment in Texas and New Mexico would primarily affect cropland and intensively grazed native rangeland. It is estimated that 75,000 acres of native vegetation used as rangeland would be removed. Grama, bluestem, and mesquite grasslands would be the most extensively impacted vegetation types. Secondary effects to vegetation would be of a smaller magnitude than those discussed for the Proposed Action. Impact changes over time are discussed under the Proposed Action.

Areas used for roads and structures would be permanently lost from vegetation reestablishment, grazing, and other related uses. Cleared areas which are not used for roads or structures will have the potential for being revegetated. The rate of natural revegetation depends on such factors as the annual rate and seasonal distribution of the precipitation, the substrate characteristics, the intensity of erosive forces, and the response of reestablishing species to disturbed conditions. Natural revegetation will be inhibited if the soil has been compacted, covered with overburden materials unsuitable for plant growth, or if the surface soil is removed. If a suitable substrate remains after construction activities, partial vegetation recovery can be expected from natural processes within a few years after the end of construction.

Construction and operation of the system would reduce the usefulness of the cleared and surrounding areas, which supported native vegetation, for livestock forage, wildlife habitat, and recreation. Many species of common animals which rely on vegetation would be lost. The disturbed areas would be subject to erosion, and resulting impacts to nearby streams or rivers, farming operations, or population centers.

The area of native vegetation cleared would be significantly less than for the Proposed Action (because there is less native vegetation remains in Texas/New Mexico than in Nevada/Utah), and the recovery of the native vegetation would proceed more rapidly. Table 4.3.1.5-2 lists the directly impacted counties and the estimated acreage of native vegetation which would be removed.

Vegetation removal is unavoidable if the system is to be constructed. However, the cleared area can be kept to a minimum, and much of the adverse impacts associated with vegetation clearance could be avoided through mitigation measures. Without mitigation, the significant adverse impacts from vegetation clearing would range from short term to permanent.

The implementation of a comprehensive revegetation program for the Texas/-New Mexico full deployment alternative would cost significantly less and would not require significant quantities of irrigation water compared to the Proposed Action.

No native vegetation will be removed directly as a result of a first OB near Clovis. LANDSAT imagery analysis shows that virtually all the land in the vicinity of Clovis is agricultural. The nearest extensive area of native vegetation is located 25 mi north, in the Canadian Breaks area. The same is true of a second OB.

ALTERNATIVE 8 (4.3.1.5.10)

Split basing would result in the removal of native vegetation from approximately 85,000 acres in the Nevada/Utah project area (see Figure 4.3.1.5-7) and 50,000 acres in the Texas/New Mexico project area. The impacts to native vegetation in the Nevada/Utah project area would be reduced roughly 50 percent compared to the proposed project. In Nevada, a proportionately greater amount of the shadscale scrub vegetation type would be cleared due to the elimination of clusters within hydrologic subunits, including Kobeh and Antelope valleys, which are predominantly covered by sagebrush. In Utah, hydrologic subunits which are predominantly covered by alkali sink scrub and shadscale scrub vegetation types, including Fish Springs and White valleys, have been eliminated.

This split basing alternative shifts one half of the project layout away from relatively undisturbed native vegetation (in Nevada and Utah) and into rangeland and cropland and more heavily disturbed native rangeland in Texas and New Mexico. Therefore, a less significant impact to relatively undisturbed native vegetation would occur from this split basing alternative compared to the Proposed Action. Due to the higher levels of precipitation and the generally more favorable soil conditions encountered in Texas and New Mexico, natural revegetation can be expected to proceed more rapidly for this half of the project layout. Revegetation of the Texas/New Mexico portion of the split basing layout would be less expensive than the Proposed Action and would not require significant quantities of irrigation water.

Impacts at the Coyote Spring OB would be the same as those discussed for the Proposed Action, and those at the Clovis OB would be the same as those for Alternative 7.

Table 4.3.1.5-2. Potential impact to native vegetation in Texas/New Mexico for Alternatives 7 and 8.

COUNTY	COUNTY AREA (ACRES)	AREA WHICH WOULD BE DISTURBED (ACRES)	POTENTIAL NATIVE VEGETATION REMOVED[5]	SHORT- AND LONG-TERM IMPACT[1]
Counties with M-X Clusters and DTN				
Bailey, TX[2]	534,400	3,500	500	
Castro, TX	563,200	3,900	200	
Cochran, TX[2]	500,800	2,400	500	
Dallam, TX	945,200	20,000	6,800	
Deaf Smith, TX[2,3]	966,400	16,400	3,900	
Hartley, TX[2,3,4]	952,300	10,700	8,200	
Hockley, TX[2]	see Lamb Co.			
Lamb, TX[2]	654,100	2,200	0	
Oldham, TX[2]	945,300	1,800	100	
Parmer, TX[2]	549,800	7,000	600	
Randall, TX	584,000	1,300	600	
Sherman, TX	586,200	700	300	
Swisher, TX	see Castro Co.			
Chaves, NM[2]	389,400	13,700	13,600	
Curry, NM[2]	897,900	7,800	2,800	
DeBaca, NM[2]	1,507,800	1,300	1,300	
Guadalupe, NM[2]	see Quay Co.			
Harding, NM[2]	1,365,400	4,900	4,800	
Lea, NM[2]	2,811,200	900	700	
Quay, NM[2]	1,840,000	14,500	10,300	
Roosevelt, NM[2,3,4]	1,570,800	18,500	14,200	
Union, NM[2]	2,442,200	6,500	4,600	
Overall DDA for Alternative 7		138,000	74,000	
Overall DDA for Alternative 8		70,000	48,600	

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[1] No impact. (No vegetation removed.)

Low impact. (Less than 1,000 acres vegetation removed.)

Moderate impact. (Between 1,000 and 5,000 acres vegetation removed.)

High impact. (Greater than 5,000 acres vegetation removed.)

[2] Affected counties under Alternative 8.

[3] Conceptual location of Area Support Centers (ASCs) for Alternative 7.

[4] Conceptual location of Area Support Centers (ASCs) for Alternative 8.

[5] Includes area for DTN, cluster roads, shelters, construction camps and concrete plants and is based on LANDSAT analysis.

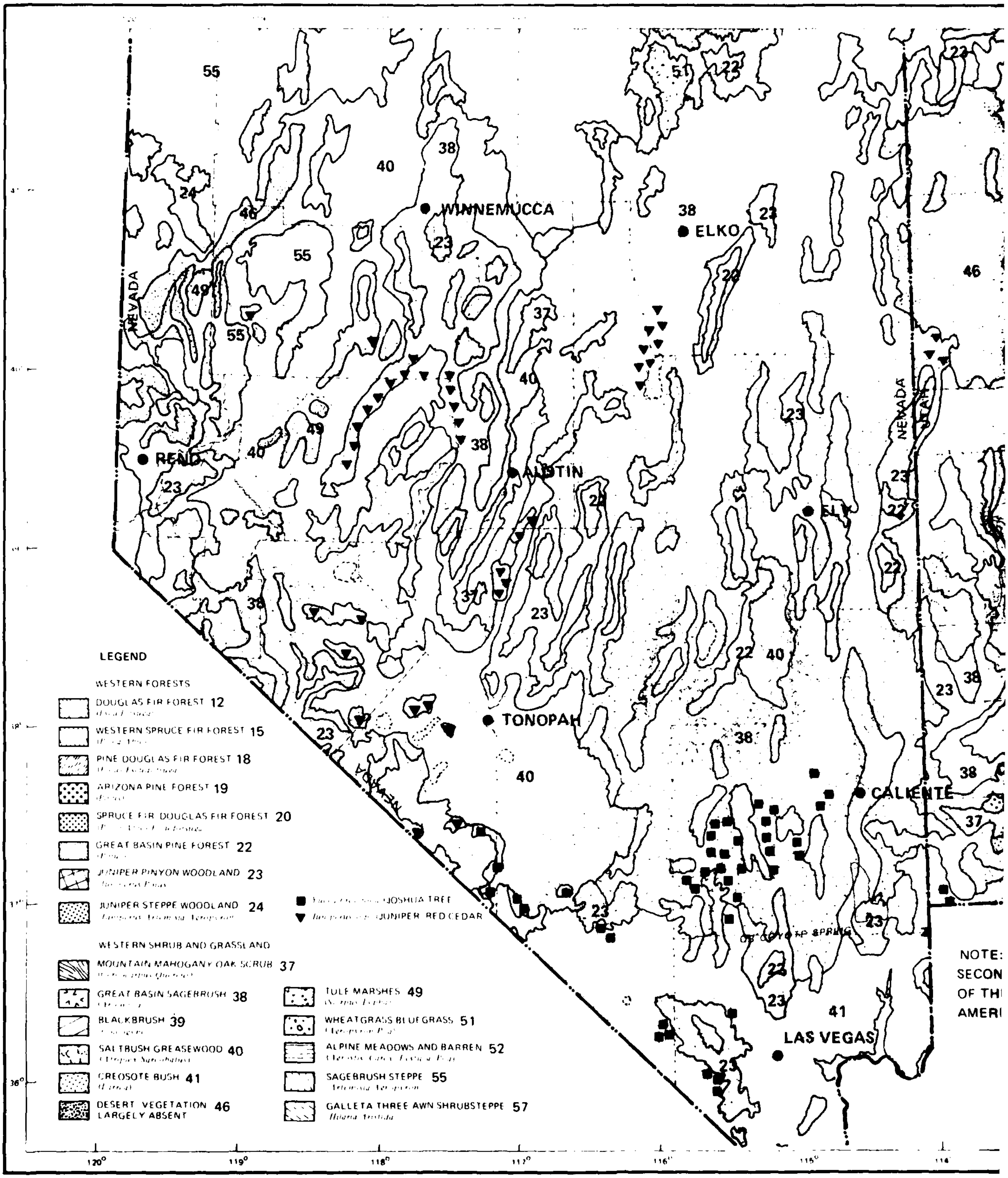

Figure 4.3.1.5-7. Simplifi
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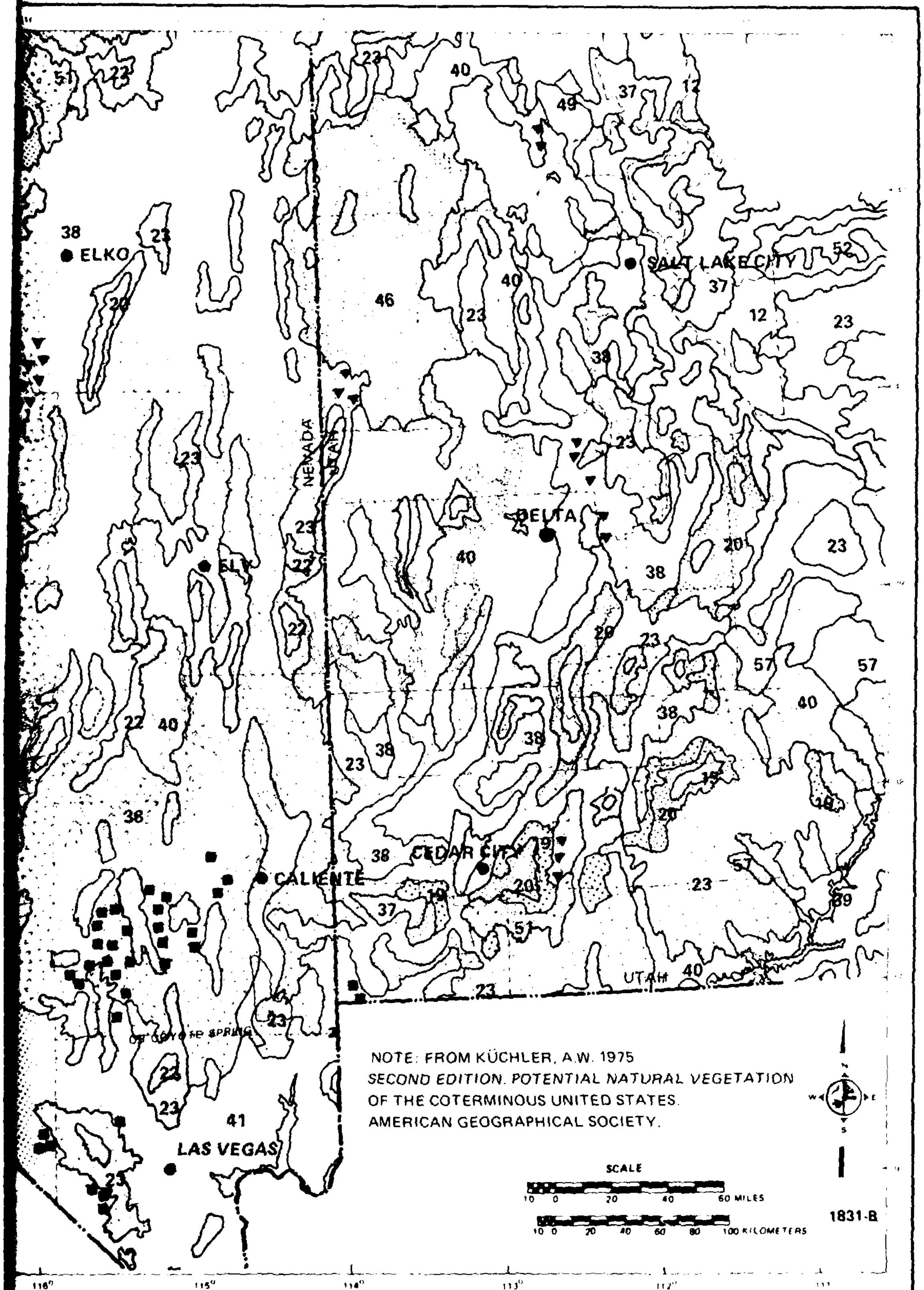

Figure 4.3.1.5-7. Simplified vegetation type map, Nevada/Utah, and Alternative 8.

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Wildlife



Pronghorn Antelope

PRONGHORN ANTELOPE

INTRODUCTION (4.3.1.6.1)

Pronghorn are a valuable wildlife resource because they are a prized game animal and have a high aesthetic value. For the 1978 hunting season, 5,163 people applied for the 320 available tags in Utah while 2,625 applied for the 391 available tags in Nevada (Jense and Burruss, 1979; Tsukamoto, 1979). Their abundance and range were greatly reduced in the late 1800s and early 1900s, but present management is assisting population recovery in some areas of the Great Basin. Impact analysis was performed in three steps: (1) a description of project effects on pronghorn, (2) an assessment of the impact (all effects combined) to pronghorn, and (3) a determination of the significance of the impact. Effects were determined by combining baseline information presented in Chapter 3 with project information. These effects result primarily from construction activities, water use, and recreation activities of project-related people. It is assumed that impacts to pronghorn populations would occur wherever habitat was lost, even if only temporarily (on the order of one year). Since field observations and discussions with wildlife managers indicate that pronghorn will avoid areas up to a distance of about 1 mi (1.6 km) from sites under construction, short-term habitat loss was calculated as both the area directly involved in construction and the area within one mile (1.6 km) of construction. Long-term habitat loss was calculated as only that area which would be directly involved in construction (where vegetation is lost).

Indirect impacts are more difficult to quantify than are direct impacts. An index of indirect effects was determined in the vicinity of the operating bases. Short-term, indirect impacts in the DDA were also ranked using construction camp location and size, but the values did not change the general levels of impact determined for direct effects. Long-term indirect impacts attributable to project activities in the DDA, excluding operating base effects, are expected to be negligible.

PROPOSED ACTION (4.3.1.6.2)

Figure 4.3.1.6-1 shows the relationship between pronghorn range and conceptual project configuration. Since pronghorn do not range throughout the

potential deployment area, direct project effects would be limited to the areas where overlap occurs, the greatest effect occurring where key habitat is disturbed. Key habitat is defined as areas where pronghorn are most frequently found, and includes water sources important for pronghorn survival, particularly during summer and at kidding areas. The conceptual project configuration for the Proposed Action would have construction activities dispersed throughout much of the key habitat in Lake, Railroad, Hot Creek and Hamlin valleys in Nevada and in Pine and Tule (White) valleys in western Utah. The project also intersects large portions of pronghorn range in Fish Creek, Wah Wah, Ralston, Patterson Wash, Lake, Railroad, Hot Creek, Little Smoky, Antelope, Stone Cabin, and Kobeh valleys. Thus, direct effects of project deployment would be expected in these areas.

The noise and visual effects of construction activities are expected to occur over an area considerably larger than that actually disturbed during construction. Pronghorn have an acute sense of sight and are not accustomed to construction. The large and dispersed nature of the M-X project coincides with much of the known pronghorn range in the potential deployment area, often dissecting their habitat into small segments which would not provide refuge from construction activities. Such division of habitat may also restrict access to localized high quality forage areas and water sources.

Water use for project construction will cause localized reductions in water table level in the vicinity of source wells. This could effect nearby spring-fed pronghorn water sources. Pronghorn are dependent upon key water sources within their range, especially during summer when vegetation moisture content is relatively low (Beale and Smith, 1970). Water table depression may seriously threaten some of these key water sources. Well locations have not been determined at this time, and consequently, potential for impact to specific pronghorn water sources cannot presently be determined.

Indirect effects resulting from recreational activities of construction workers and operations personnel would occur in areas where the project overlaps pronghorn range, as well as in the vicinity of construction camps or operating bases (OBs). Impacts of siting OBs in regions inhabited by pronghorn are primarily associated with increased human population. Water effects would be the same as described above for construction effects. In addition, an increase in human population will result in an increase in hunters, fishermen, picnickers, and ORV enthusiasts. Pronghorn are nervous animals that are easily disturbed by human activity. Research has documented avoidance of vehicles, interruption of normal behavior patterns, and increased foraging effort associated with vehicular disturbance in Great Basin pronghorn (HDR draft technical report: Pronghorn, foraging economics, and group sizes: implications for conservation biology). Thus, ORV use and travel through key pronghorn habitat could be expected to significantly affect pronghorn populations. Increased human population would also increase illegal harvest of pronghorn in areas surrounding population centers. Illegal harvest is extremely difficult to measure, and may be as large or greater than the legal harvest (Pursley, 1977). For conservative estimates, present illegal harvest of pronghorn was assumed to be 75 percent of the legal harvest and would increase 50 percent with a 100 percent increase in human population (population increase figures. For worst-case estimates, illegal harvest was assumed to be 150 percent of the legal harvest and to increase 100 percent with 100 percent increase in human population. These increases were assumed to affect pronghorn populations within 50 mi (80 km) of OB

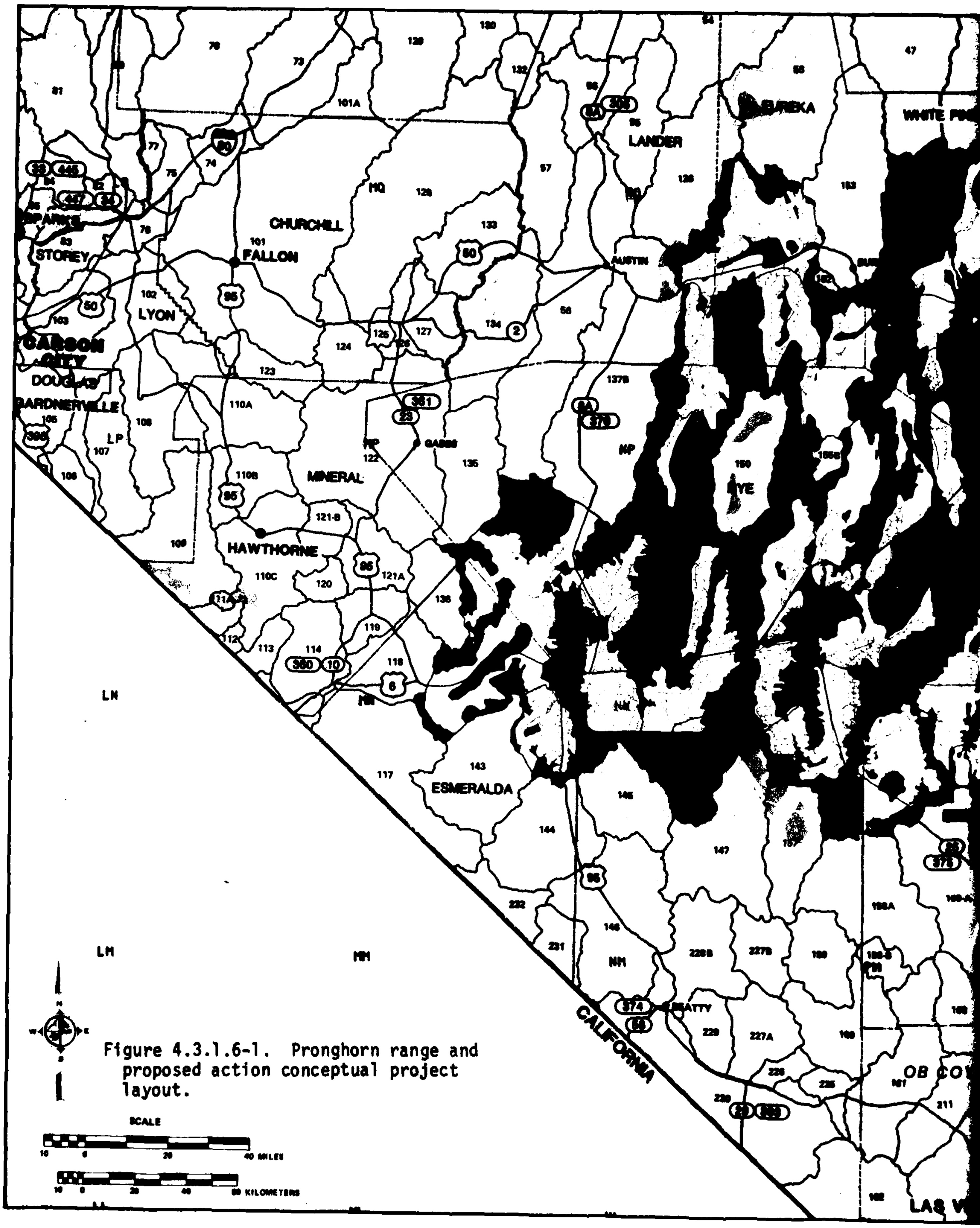
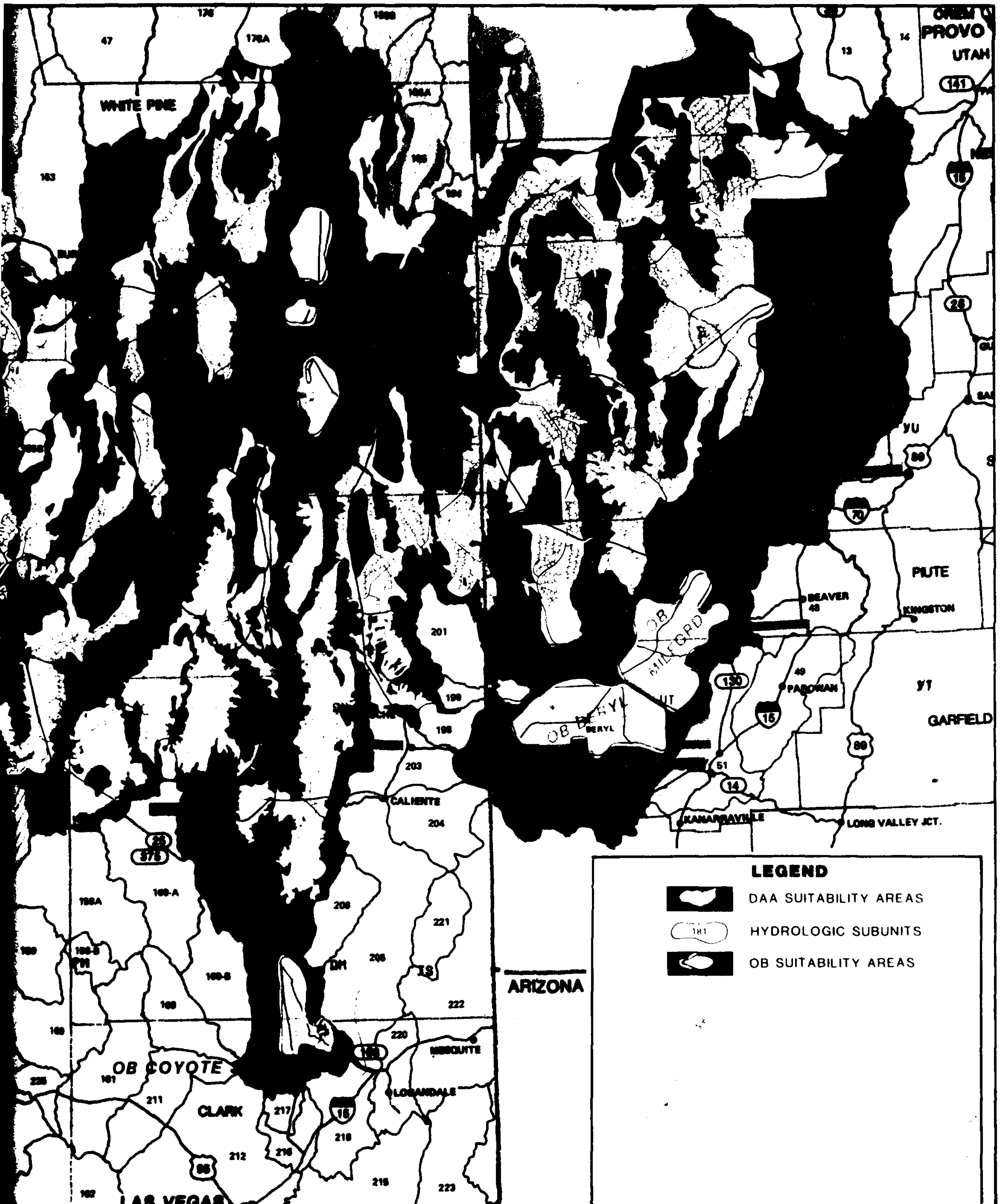


Figure 4.3.1.6-1. Pronghorn range and proposed action conceptual project layout.


WHITE PINE
PROVO
UTAH
PIUTE
BEAVER
KINGSTON
PAROWAN
GARFIELD
OB MILFORD
OB BERYL
BERYL
KANARRAVILLE
LONG VALLEY JCT.
CALIENTE
MESQUITE
LOGANDALE
OB COYOTE
CLARK
LAS VEGAS
ARIZONA
LEGEND
DAA SUITABILITY AREAS
HYDROLOGIC SUBUNITS
OB SUITABILITY AREAS

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locations; therefore, calculations were based on 1978 legal harvest figures (Tsukamoto 1979, Jense 1979) for pronghorn management units within 50 mi (80 km) of OB locations.

DDA Impacts

As noted above, the project could affect pronghorn through construction activities, water use, and recreation activities of construction personnel. Placement of facilities will result in habitat loss through removal of vegetation and pronghorn avoidance of construction activities. A further loss of habitat would occur if project activity restricts movement or access to water. Consumption of water during construction may cause a loss of surface water in springs. If this occurs, the carrying capacity of the existing pronghorn range may be reduced. Such effects, however, could be mitigated as discussed below. Increased human activity, including illegal harvest, harassment, and habitat degradation, will also affect pronghorn.

Implementation of other projects such as the Anaconda Moly project near Tonopah, White Pine Power Project (WPPP) in White Pine County, Pine Grove Moly project (Pine Valley), Allen Warner project in Dry Lake Valley, Alunite mine in Wah Wah Valley and Intermountain Power Project (IPP) near Delta would compete for resources (e.g., water) and cause additional land disturbances and population growth. However, the effects of construction activities associated with these projects would be small compared to that for M-X, the exception being water use. The cumulative effects of water use, especially in areas where water availability is limited, could be measurable. For example, water use for the IPP could compound the effect of M-X water use in the Delta area. Cumulative effects of water consumption on pronghorn in the vicinity of other projects will depend upon amount of water used, water availability, aquifer properties and timing of use by M-X and other projects. As for the combined indirect effects on pronghorn caused by human population growth, the incremental increase resulting from construction and operation of the other projects will be small compared to that for M-X, except in the case of IPP near Delta where population increases will be similar to those proposed for M-X.

M-X will have the greatest affect on pronghorn during the construction phase, since this is when intense activity will be widespread in their habitat. Mortality resulting from habitat loss and poaching will decrease herd size during this time. After construction is completed, pronghorn are likely to repopulate the remaining suitable habitat, either from contiguous undisturbed areas or through transplants made by wildlife departments. Pronghorn population levels are expected to stabilize at new levels. Levels will depend upon the amount and type of habitat permanently lost (e.g., marginal range versus key habitat), the rate of recovery (revegetation) of temporarily disturbed areas, and behavioral responses to the presence and operation of the facilities. The time required for population recovery will be site specific, determined by habitat quality and climatic factors. Recovery should occur, but it could take approximately 10 to 20 years, assuming intensive management and no unusually severe climatic conditions (e.g., drought).

The effects of M-X construction will reduce pronghorn abundances in the short-term where project activity overlaps substantial portions of their range or any key habitat. The absolute level of this reduction cannot be reasonably estimated, but a worst case would be extirpation from some areas, possibly in Hamlin, Wah

Wah, Kobeh, or Lake valleys. Long-term pronghorn abundance, however, is expected to be reduced very little since mitigation and management should bring pronghorn populations back to near pre-project levels. The reduction in long-term abundance, as compared to future predictions without M-X, will be related to amount of habitat lost.

The small amount of pronghorn habitat permanently lost represents an irreversible and irretrievable commitment of resources. On the other hand, loss of pronghorn attributed to this habitat loss, can be recovered through mitigation measures (see below).

The consequences of the previously discussed effects on pronghorn will be to reduce their numbers. The greatest reduction will occur during construction in valleys where key habitat is lost, followed by recovery to new levels. This in turn will reduce recreational opportunities such as hunting, photography, and observation. Since pronghorn are a prized game animal with limited numbers in the potential deployment area, any measureable decrease in number is likely to be perceived as a significant impact, even if only short-term. Such perceived impacts are expected to occur primarily in those valleys where project activities are extensively dispersed throughout pronghorn range or in any key habitat.

The effects of construction activities are generally unavoidable because they result largely from pronghorn behavior, which cannot be easily modified. Pronghorn are known to habituate to some types of human disturbances, but this requires a longer period of time than that for project construction and often requires intensive management. The effects of people and water use are largely avoidable and can be mitigated.

Predicted effect levels and their significance are summarized in Table 4.3.1.6-1 for each hydrologic subunit in which project elements would be deployed for the Proposed Action. Indirect effects could occur in subunits with no project elements as a result of recreation by construction workers, but these were assumed to be insignificant. From the table, it can be seen that signficant short-term impacts are likely to occur in 21 of the 41 subunits. Of the remaining 20 hydrologic sub-units, 15 are not inhabited by pronghorn and no significant impacts are expected in the other 5. The presence of project elements within key habitat was the major reason for the determination of significant impact (in 18 of 21 hydrologic subunits). The short-term key habitat loss, including the 1 mi (1.6 km) avoidance factor, ranged from zero to 95 percent (Hot Creek Valley) with the majority exceeding 40 percent. The loss of range, other than key habitat, exceeded 50 percent of that present in 11 hydrologic subunits. Kobeh, Antelope, and Little Smoky valleys were the only ones in which this occurred with no loss of key habitat. Long-term impacts to pronghorn are predicted to be much lower than those predicted for the short-term. The actual habitat disturbed during construction was calculated to be less than 5 percent of the available habitat in all hydrologic subunits (Table 4.3.1.6.1-1). Other factors, however, may act to increase the area of habitat loss through behavioral responses of pronghorn to the presence and operation of the various facilities. Loss of even a small amount of key habitat may impact pronghorn populations, particularly if the kidding areas are affected, but loss of small amounts of range are not expected to have any measureable long-term impact on pronghorn.

Several mitigation measures could be taken to reduce or compensate for the significant adverse impacts described above.

Table 4.3.1.6-1. Potential direct impact to pronghorn in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	ABUNDANCE INDEX[1]	SHORT-TERM EFFECTS % HABITAT LOSS[2] RANGE	SHORT-TERM EFFECTS % HABITAT LOSS[2] KEY	SHORT-TERM EFFECTS OVERALL IMPACT[3]	LONG-TERM EFFECTS % HABITAT LOSS RANGE	LONG-TERM EFFECTS % HABITAT LOSS KEY	LONG-TERM EFFECTS OVERALL IMPACT[4]
	Subunits with M-X Clusters and DTN							
4	Snake	High	35	45	High	1	1	Moderate
5	Pine	High	25	65	High	1	2	Moderate
6	White	High	20	90	High	0	2	Moderate
7	Fish Springs	High	85	15	High	1	1	Moderate
8	Dugway	High	10	55	High	0	1	Moderate
9	Government Creek	High	25	30	High	1	1	Moderate
46	Sevier Desert	High	16	50	High	1	2	Moderate
46A	Sevier Desert-Dry Lake[5]	High	35	25	High	1	1	Moderate
54	Wah Wah	High	95	50	High	2	1	Moderate
137A	Big Smoky-Tonopah Flat	No impact	0	0	No impact	0	0	No impact
139	Kobeh	High	55	0	High	1	0	No impact
140A	Monitor—Northern	Moderate	0	0	No impact	0	0	No impact
140B	Monitor—Southern	No impact	0	0	No impact	0	0	No impact
141	Ralston	High	80	35	High	2	2	Moderate
142	Alkali Spring	No impact	0	0	No impact	0	0	No impact
148	Cactus Flat	High	6	0	No impact	0	0	No impact
149	Stone Cabin[5]	High	55	30	High	1	1	Moderate
151	Antelope	Moderate	75	0	High	5	0	No impact
154	Newark[5]	No impact	0	0	No impact	0	0	No impact
155A	Little Smoky—Northern	No impact	0	0	No impact	0	0	No impact
155C	Little Smoky—Southern	Moderate	65	0	High	2	0	No impact
156	Hot Creek	High	65	95	High	2	1	Moderate
170	Penoyer	Moderate	0	0	No impact	0	0	No impact
171	Coal	No impact	0	0	No impact	0	0	No impact
172	Garden	No impact	0	0	No impact	0	0	No impact
173A	Railroad—Southern	High	72	74	High	2	2	Moderate
173B	Railroad—Northern	High	45	63	High	1	1	Moderate
174	Jakes	No impact	0	0	No impact	0	0	No impact
175	Long	No impact	0	0	No impact	0	0	No impact
178B	Butte—South	No impact	0	0	No impact	0	0	No impact
179	Steptoe	High	0	0	No impact	0	0	No impact
180	Cave	No impact	0	0	No impact	0	0	No impact
181	Dry Lake[5]	No impact	0	0	No impact	0	0	No impact
182	Delamar	No impact	0	0	No impact	0	0	No impact
183	Lake	High	85	85	No impact	1	1	Moderate
184	Spring	High	2	10	High	1	1	Moderate
196	Hamlin	High	40	80	High	1	2	Moderate
202	Patterson	High	80	45	High	1	1	Moderate
207	White River[5]	No impact	0	0	No impact	0	0	No impact
208	Pahroc	No impact	0	0	No impact	0	0	No impact
209	Pahranagat	No impact	0	0	No impact	0	0	No impact
	Overall DDA Impact		40	45	High	1	1	Moderate

3826-3

[1,3,4] No impact. (No range or key habitat present for Abundance Index.)
Moderate impact. (Range present for Abundance Index.)
High (significant) impact. (Key habitat present for Abundance Index.)

[2] Habitat loss during construction, including a 1 mile (1.6 km) avoidance effect zone around all construction activities.

[3] Loss of any key habitat or more than 50 percent of range in hydrologic subunit is considered significant. Loss of 26-50 percent range is considered moderate and loss of under 26 percent of range in a hydrologic subunit is considered insignificant.

[4] Any key habitat loss remaining after construction could cause a moderate impact.

[5] Conceptual location of Area Support Center (ASC).

- o Develop new water sources in areas outside of project influence which lack water but are otherwise suitable habitat.
- o Limit ORV use in pronghorn habitat areas subject to Air Force and Bureau of Land Management jurisdiction.
- o Prohibit possession of high power rifles by construction workers while stationed in construction camps (during both work and off duty hours).
- o Time construction activities within each hydrologic subunit where key habitat is present so that this habitat is not disturbed during the critical summer months.
- o Strict enforcement of hunting laws during construction by state wildlife authorities.

Coyote Spring Valley OB Impacts

Pronghorn do not inhabit the southern Nevada area near Coyote Spring Valley and, thus, would not be affected by location of an Operating Base in that vicinity.

Milford OB Impacts

Figure 4.3.1.6-2 shows the relationship between pronghorn distribution and the operating base suitability areas around Milford. The proposed operating base at Milford is located within pronghorn habitat in the Escalante Desert along the southern base of Topache Peak, the Shauntie Hills and White Mountain. Construction of an OB at this site would eliminate 4,500 acres of pronghorn habitat, of which over half is key habitat. Additional key pronghorn habitat is located 7 miles (11 km) southwest of the OB along the eastern and southern slopes of the southeast end of the Wah Wah Mountains. OB construction and subsequent human activity in the OB vicinity would substantially affect pronghorn use of key habitats; extirpation of pronghorn in these areas is considered very likely. Water consumption may further impact these habitats by destroying key water sources as discussed previously. Locating the OB in other areas within the OB suitability area southeast of the Union Pacific railroad tracks and north of Lund, or due west of Thermo Siding and due north of Nada, should reduce these effects.

An influx of an estimated 14,700 permanent residents to the Milford area would affect other pronghorn populations in Pine Valley, Hamlin Valley, Wah Wah Valley, Snake Valley, Tule Valley (White Valley hydrologic subunit), Parowan Valley, and the Sevier and Escalante Deserts (Milford, Cedar City, Lund and Beryl-Enterprise hydrologic subunits). Off-road vehicle use in the Escalante Desert is expected to be high, and would threaten the already low pronghorn population in the Milford area and in key habitat south of Lund. ORV use in Pine, Hamlin and Wah Wah Valleys increase to a much lesser extent.

The 1978 legal harvest in the two Utah herd units within 50 mi of Milford (see Section 3.2.3.8 for Utah Game Management area locations) area locations was 34 pronghorn (Jense, 1979); a conservative estimate of illegal harvest resulting from the 237 percent population increase is 30 pronghorn; a worst case estimate is 120

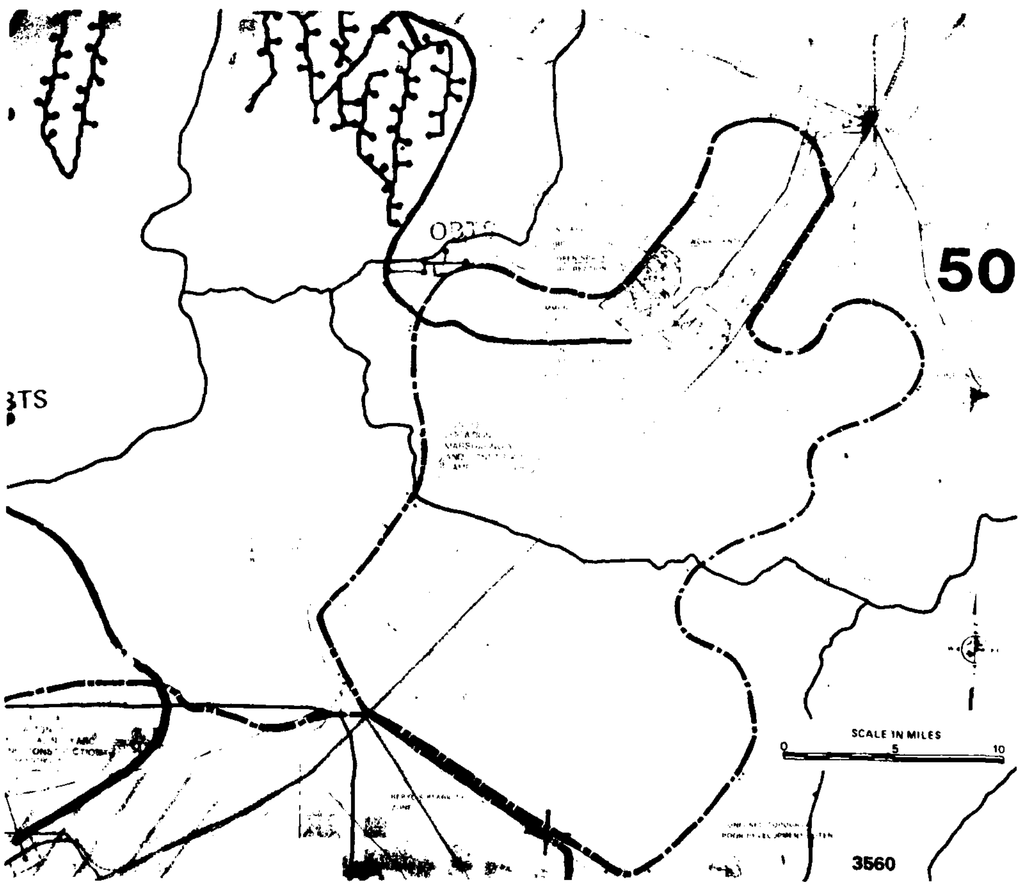


Figure 4.3.1.6-2. Pronghorn distribution and Milford operating base and vicinity.

animals (see Proposed Action for method of calculation). The combined effect of ORV use and illegal harvest would undoubtedly impact populations in the Sevier Desert, Hamlin, Pine, and Wah Wah valleys, and may affect populations in Snake, Parowan and Tule valleys as well. Other projects in the area are not expected to change these effects.

The impact of locating an OB near Milford would persist throughout the lifetime of the M-X system. Pronghorn populations in the region would not recover until M-X personnel leave the area, due to the continued effect of the activities of 14,700 people. During the peak construction period, the impacts would be slightly greater because of higher population levels in the Milford area. The impact of this large human population growth would be largely unavoidable. Pronghorn abundance would decline in this area, with an associated decline in both consumptive (e.g., hunting) and non-consumptive use (e.g., photography and animal observation). Undoubtedly, some Milford residents would experience a reduction in their aesthetic enjoyment of the region because of decrease or extirpation of pronghorn populations; this would be perceived as significant to some proportion of the area's population.

Certain measures may effectively mitigate impacts to pronghorn in the Milford area. These include locating the OB so as to avoid key habitat within the OB suitability zone, and constructing artificial water sources in key areas if water table depression becomes a serious threat. Restricting ORV use in key habitats and increasing law enforcement activities in pronghorn range to reduce illegal harvest may also be helpful.

A summary of potential impact to pronghorn due to OB locations for the Proposed Action is presented in Table 4.3.1.6-2.

ALTERNATIVE 1 (4.3.1.6.3)

DDA Impacts

The DDA configuration for Alternative 1 is the same as that for the Proposed Action, and the DDA impacts are the same.

Coyote Spring Valley OB Impacts

Pronghorn do not inhabit the region around Coyote Spring Valley and would not be affected by locating an OB in that area.

Beryl OB Impacts

Figure 4.3.1.6-3 shows the relationship between pronghorn distribution and the operating base suitability area around Beryl. The OB suitability envelope near Beryl occupies pronghorn range in the Escalante Desert. Approximately 100 mi^2 (260 km^2) of key habitat is located around Table Butte 10 mi (16 km) east of Beryl. The removal of 3,000 to 6,000 acres (1,200 to 2,400 ha) of pronghorn range for construction of the OB should have no significant impact on pronghorn unless the OB is located in the Table Butte key habitat. Recreation use and illegal harvest by M-X personnel may significantly affect pronghorn populations in the region as discussed previously for the Proposed Action.

Table 4.3.1.6-2. Potential overall impact to pronghorn resulting from construction and operation of M-X operating bases for the Proposed Action and Alternatives 1-8 (page 1 of 2).

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE[1] INDEX	ESTIMATED OVERALL IMPACT[1]				
			PROPOSED ACTION	ALT. 1	ALT. 2	ALT. 3	ALT. 4
NO	NAME		COYOTE SPRING/ MILFORD	COYOTE SPRING/ BERYL	COYOTE SPRING/ DELTA	BERYL/ ELY	BERYL/ COYOTE SPRING
	Subunits or Counties within OB Suitability Area						
46	Sevier Desert						
46A	Sevier Desert-Dry Lake[2]						
50	Milford						
52	Lund District						
53	Beryl-Enterprise						
179	Steptoe						
210	Coyote Springs						
219	Muddy River Springs						
	Curry, NM[3]						
	Hartley, TX[3]						
	Other Affected Subunits or Counties						
4	Snake						
5	Pine						
6	White						
7	Fish Springs						
8	Dugway						
9	Government Creek						
46A	Sevier Desert-Dry Lake						
49	Parowan						
50	Milford[2]						
51	Cedar Spring						
53	Beryl-Enterprise						
54	Wah Wah						
155	Little Smoky N & S						
183	Lake						
184	Spring						
185	Tippet						
196	Hamlin						
202	Patterson						
	Overall Alternative Impact						

3827-2

[1] No impact. (No range or key habitat present for Abundance Index.)
Moderate impact. (Range present for Abundance Index.)
High (significant) impact. (Key habitat present for Abundance Index.)

[2] Conceptual location of Area Support Centers (ASCs) for the Proposed Action and Alternatives 1-6.

[3] Conceptual location of Area Support Centers (ASCs) for Alternative 7.

Table 4.3.1.6-2. Potential overall impact to pronghorn resulting from construction and operation of M-X operating bases for the Proposed Action and Alternatives 1-8 (page 2 of 2).

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE[1] INDEX	ESTIMATED OVERALL IMPACT[2]			
			ALT. 5	ALT. 6	ALT. 7	ALT. 8
NO.	NAME		MILFORD/ ELY	MILFORD/ COYOTE SPRING	CLOVIS DALHART	COYOTE SPRING CLOVIS
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert					
46A	Sevier Desert-Dry Lake[2]					
50	Milford[2]					
52	Lund District					
53	Beryl-Enterprise					
179	Steptoe					
210	Coyote Springs					
219	Muddy River Springs					
	Curry, NM[3]					
	Hartley, TX[3]					
	Other Affected Subunits or Counties					
4	Snake					
5	Pine					
6	White					
7	Fish Springs					
8	Dugway					
9	Government Creek					
46A	Sevier Desert-Dry Lake[2]					
49	Parowan					
50	Milford[2]					
51	Cedar Spring					
53	Beryl-Enterprise					
54	Wah Wah					
155	Little Smoky N & S					
183	Lake					
184	Spring					
185	Tippet					
196	Hamlin					
202	Patterson					
	Overall Alternative Impact					

3827-2

[1]

No impact. (No range or key habitat present for Abundance Index.0

Moderate impact. (Range present for Abundance Index.)

High (significant) impact. (Key habitat present for Abundance Index.)

[2]Conceptual location of Area Support Centers (ASCs) for the Proposed Action and Alternatives 1-6.

[3]Conceptual location of Area Support Centers (ASCs) for Alternative 7.

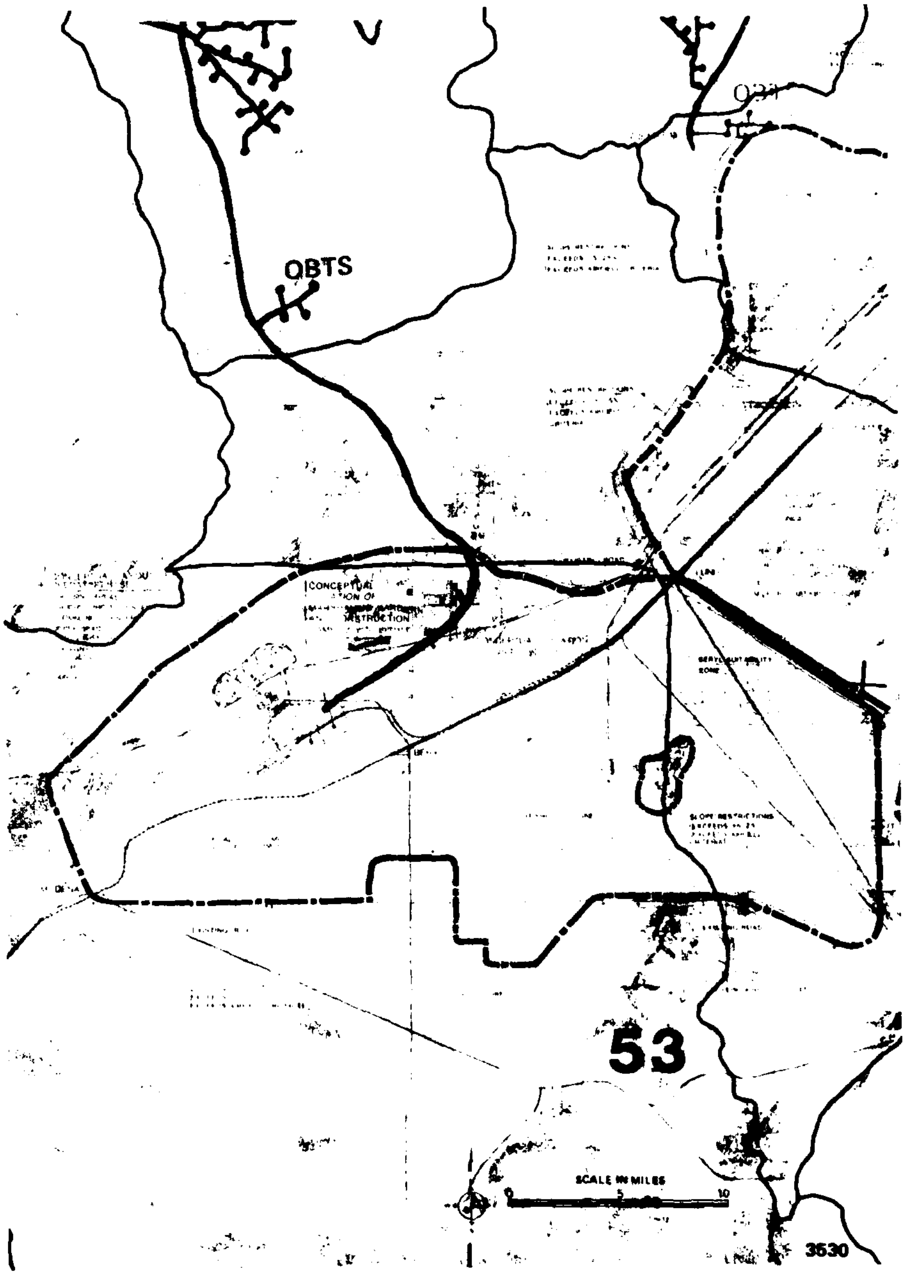


Figure 4.3.1.6-3. Pronghorn distribution and Beryl operating base and vicinity.

Pronghorn in Hamlin Valley, Pine Valley, Wah Wah Valley and the Escalante Desert (Milford, Cedar City, Lund and Beryl-Enterprise hydrologic subunits) would most likely suffer to some exent from an estimated permanent population increase of 14,500. Populations in Parowan, Patterson and Lake Valleys could potentially be affected, and the impact to the Table Butte animals is likely to be significant. Heavy use and no mitigation could eliminate pronghorn from Table Butte key habitat, but some effort to reduce ORV and illegal harvest effects could hold losses to a moderate reduction in population. Water consumption by 14,500 residents may threaten important pronghorn water sources near Table Butte. If water table depression is great enough to dry up key water sources, pronghorn would be displaced from the area. Proposed developments other than M-X in the Beryl vicinity are not expected to significantly affect pronghorn.

The impact of an OB site at Beryl would persist throughout the lifetime of the M-X project. No significant recovery of the pronghorn resource is expected until M-X personnel vacate Beryl. During the peak construction period, impacts would be slightly greater because of higher population levels in the Beryl area. Because pronghorn are a highly valued resource for both consumptive and non-consumptive use, the decline in Escalante Desert pronghorn would be perceived as a significant negative impact by many area residents, especially if the effects are unmitigated.

Some impact to the Table Butte pronghorn is unavoidable if an OB is situated at Beryl. However, the magnitude of the impact may be reduced through some mitigation measures such as restricting ORV use and building artificial water sources.

A summary of potential impact to pronghorn due to OB locations for Alternative 1 is presented in Table 4.3.1.6-2.

ALTERNATIVE 2 (4.3.1.6.4)

DDA Impacts

DDA impacts are the same as those discussed for Proposed Action.

Coyote Spring Valley OB Impacts

Pronghorn do not inhabit the region around Coyote Spring Valley and will not be affected by locating an OB in that area.

Delta OB Impacts

The proposed OB at Delta, Utah is situated on the edge of pronghorn range in the Sevier Desert. The removal of 4,200-4,500 (1,700 to 1,800 ha) acres of potential pronghorn range to construct the OB should have no significant effect on pronghorn populations (see Figure 4.3.1.6-4). The most serious threat to Sevier Desert pronghorn posed by a Delta OB is harassment by recreationists and illegal harvest, especially in the Desert Mountain area 25 mi (40 km) north of Delta. Harassment by ORV users could potentially decrease use of this key habitat by pronghorn, but the presence of a great deal of suitable ORV use area closer to Delta should render these effects insignificant. The 1978 legal harvest in the three management areas within 50 mi of Delta was 53 pronghorn (Jense, 1979). A conservative estimate of illegal harvest resulting from the 110 percent population increase is 22 pronghorn; a

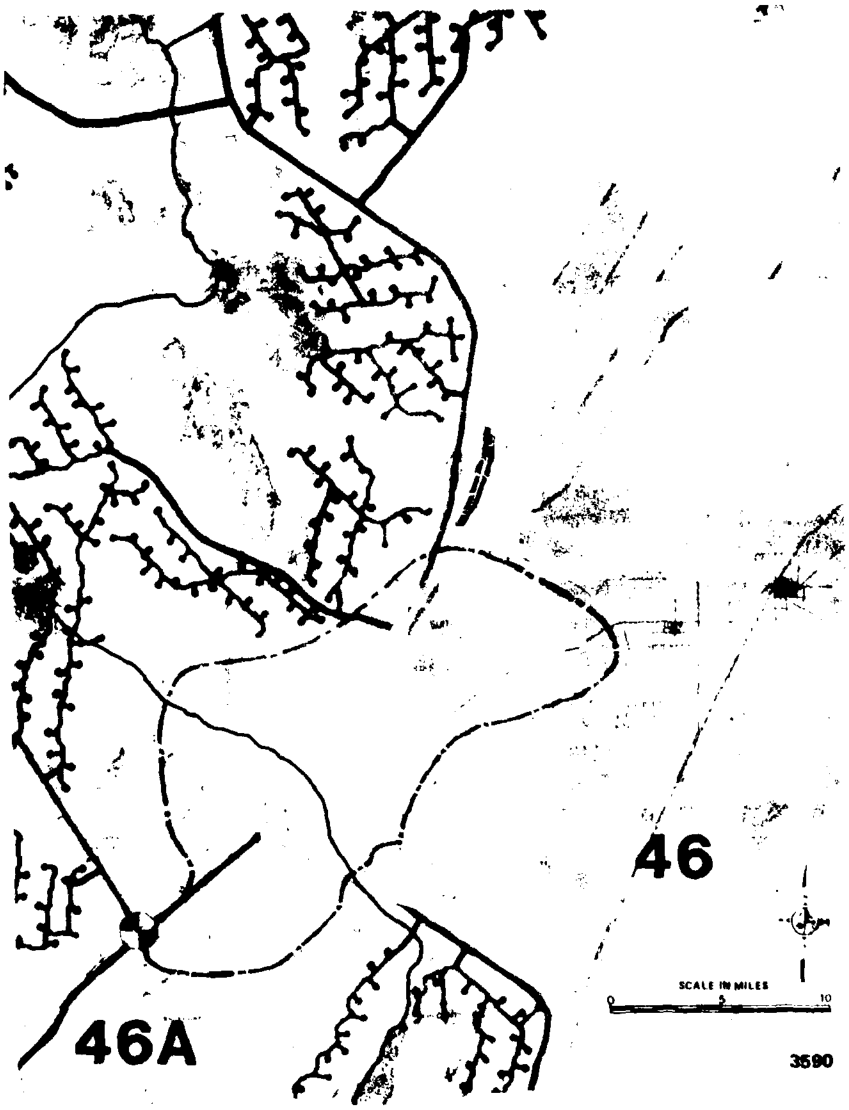


Figure 4.3.1.6-4. Pronghorn distribution and Delta operating base and vicinity.

worst-case estimate is 87 animals (see Proposed Action for method of calculation). This may affect important pronghorn populations in the Sevier Desert, Tule Valley (White Valley hydroligic subunit), Wah Wah Valley, Pine Valley, and Snake Valley. Pronghorn in Fish Springs, Dugway and Government Valleys may also suffer, but losses are not expected to be significant. Any impacts due to OB siting in Delta would persist for the duration of the M-X project. During the peak construction period, impacts would be slightly greater because of higher population levels in the Delta area. Mitigation possibilities include restricting ORV use and increased patrolling of pronghorn key habitat. A summary of potential impact to pronghorn due to OB locations for Alternative 2 is presented in Table 4.3.1.6-2.

ALTERNATIVE 3 (4.3.1.6.5)

DDA Impacts

In Alternative 3, the DDA remains the same as for the Proposed Action with the same potential impacts.

Beryl OB Impacts

Impacts of an OB located near Beryl, Utah are discussed under Alternative 1. Having Beryl as a primary base would remove an estimated 5,000-5,500 acres (2,000 to 2,200 ha) of pronghorn habitat in the Beryl area and would add approximately 19,680 permanent residents. These figures differ from those in Alternative 1 but do not substantially change the effects of OB location at Beryl.

Ely OB Impacts

The proposed OB location near Ely, Nevada will not directly remove any key pronghorn habitat unless located in the extreme northern end of the suitability zone near Warm Springs (see Figure 4.3.1.6-5). If located north of Warm Springs, OB construction would eliminate 4,500 acres (1,800 ha) of pronghorn habitat and up to 600 acres (240 ha) of key habitat. This may not significantly impact pronghorn populations, but construction and subsequent human activity in these areas pose a major threat to Steptoe Valley pronghorn. Additional impacts of an OB in Ely would stem from the indirect effects of the movements and recreational activities of an estimated 14,500 additional permanent residents in the Ely region. Spring Valley, northern Steptoe Valley, Snake Valley and Tippett Valley support some of the largest pronghorn populations in the potential M-X deployment area and include large areas of key habitat. Increased recreation pressure from fishermen, hunters, campers and ORV enthusiasts in the key habitat areas would affect pronghorn to some extent. The effects of increased vehicular travel through key habitats to favored fishing, hunting and camping spots in the Schell Creek Range could greatly impact pronghorn populations if not properly controlled. Pronghorn in Lake Valley may also be affected. The 1978 legal harvest in the 4 management areas within 50 mi of Ely was 37 pronghorn (Tsukamoto 1979). Illegal harvest of pronghorn in Spring and Steptoe valleys would increase by an estimated 19 to 78 animals as a result of an estimated 140 percent human population increase. Some impact to pronghorn resources is inevitable, but the magnitude and significance of the impact is speculative. It is reasonable to expect a reversal in the present increasing population trend, but the extent of this may not be highly significant. Because these effects are due to increased human population levels associated with an Ely OB, they would persist throughout the lifetime of the M-X project. During the peak construction period, impacts would be slightly greater because of higher population levels in the Ely

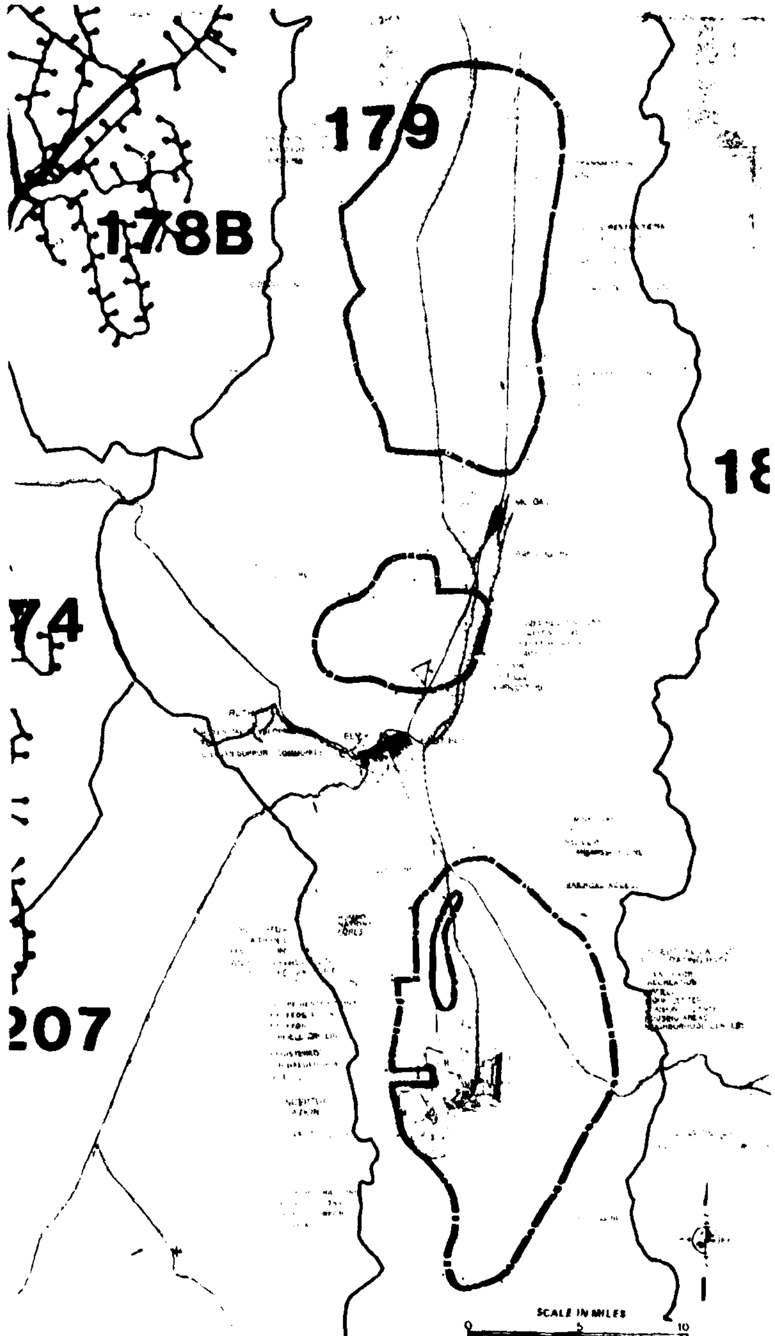


Figure 4.3.1.6-5. Pronghorn distribution and
Ely operating base and vicinity.

area. Measures that may mitigate the impact of an Ely OB include restricting vehicular access to key pronghorn habitats and increased patrolling to reduce illegal harvest.

A summary of potential impact to pronghorn due to OB locations for Alternative 3 is presented in Table 4.3.1.6-2.

ALTERNATIVE 4 (4.3.1.6.6)

DDA Impacts

The DDA in Alternative 4 is the same as that for the Proposed Action, the potential impacts would be identical to those described for it.

Beryl OB Impacts

Impacts for proposed OB location at Beryl are discussed under Alternative 1.

Coyote Spring Valley OB Impacts

Pronghorn do not inhabit the region around Coyote Spring Valley and will not be affected by locating an OB in that area.

A summary of potential impact to pronghorn due to OB locations for Alternative 4 are presented in Table 4.3.1.6-2.

ALTERNATIVE 5 (4.3.1.6.7)

DDA Impacts

Impacts for Alternative 5 are the same as for the Proposed Action.

Milford OB Impacts

Having Milford as the primary base will remove an estimated 5,000 -5,500 acres (2,000 to 2,200 ha) of pronghorn habitat in the Milford area and add approximately 19,550 permanent residents. These figures differ from those in the Proposed Action but do not substantially change the effects of OB location at Milford.

Ely OB Impacts

Impacts for the proposed OB location at Ely are discussed under Alternative 3.

A summary of potential impacts to pronghorn due to OB locations for Alternative 5 is presented in Table 4.3.1.6-2.

ALTERNATIVE 6 (4.3.1.6.8)

DDA Impacts

For Alternative 6, the DDA and potential impacts would be the same as for the Proposed Action.

Milford Ob Impacts

Impacts for the propsed OB location at Milford are discussed under Alternative 5.

Coyote Spring Valley OB Impacts

Pronghorn do not inhabit the region around Coyote Spring Valley and will not be affected by locating an OB in that area.

A summary of potential impacts to pronghorn due to OB locations for Alternative 6 is presented in Table 4.3.1.6-2.

ALTERNATIVE 7 (4.3.1.6.9)

Figure 4.3.1.6-6 shows the relationship between pronghorn distribution and configuration of this alternative. Direct project effects would be limited to areas of overlap in rangeland in 4 counties in Texas and 7 counties in New Mexico. Key habitat data comparable to those from Nevada and Utah were not available for the Texas/New Mexico High Plains. Indirect effects resulting from increased use by construction workers would occur in areas where the project overlaps pronghorn range as well as in areas near construction camps which contain no project features. The two operating bases at Clovis and Dalhart are not in pronghorn range. There are no other large-scale projects planned which might compete with M-X in the region, although there are CO_2 pipelines planned in New Mexico.

DDA Impacts

As noted above, the project could affect pronghorn through construction activities and recreation activities of construction personnel. Water use is not an issue here, as surface water features are not linked with the water source for the project, the Ogallala aquifier. Emplacement of facilities will result in short-term habitat loss through removal of vegetation and pronghorn avoidance of construction activities. This avoidance could result in a further loss of habitat if it restricts movement over and above the restrictions already imposed by fencing of range and farmland. Long-term effects would be related to permanent habitat loss. Increased human activity, primarily recreation, would affect pronghorn through illegal harvest, harassment, and habitat degradation. However, as much of the pronghorn range is privately held, these effects would be minimized through owner intervention. In Texas, pronghorn herds are managed for hunting, for which the individual landowner receives a fee from each hunter.

M-X would have the greatest effect on pronghorn during the construction phase since this is when intense activity will be widespread in their habitat. Mortality resulting from habitat loss and poaching may decrease herd size during this time. After construction is completed, pronghorn are likely to repopulate suitable habitat remaining, either from contiguous undisturbed areas or through transplants by wildlife departments. Population levels are expected to stabilize at new levels. Whether these levels are the same as for pre M-X populations will depend upon the amount of habitat permanently lost, the rate of recovery (revegetation) of temporarily disturbed areas, and behavioral responses to the presence and operation of the facilities. Habitat quality in Texas/New Mexico is

superior to that in Nevada/Utah, AUM values being five times as high in the first as in the second. Additionally, as food overlap between cattle and pronghorn in Texas/New Mexico is roughly 19 percent, overgrazed rangeland is often good habitat for pronghorn (Buechner, 1950). Due to the higher level of human disturbance already present in Texas and New Mexico, pronghorn tolerance to human activity is likely to be greater than in Nevada/Utah, reducing the effect, to the level where it could be considered not significant. See Table 4.3.1.6-3 for impact summary.

The effects of construction would reduce short-term productivity by removal of forage areas, but local extirpation is unlikely. Long-term productivity, however, is expected to be reduced very little since game management should bring abundances back to near pre-project levels. The reduction in long-term productivity, as compared to future predictions without M-X, would be related to amount of habitat lost. Due to the income derived from hunters, there would be considerable effort by landowners to restore abundances.

The small amount of pronghorn habitat permanently lost, roughly 1.1 percent of the total, represents an irreversible and irretrievable commitment of resources. Loss of animals, on the other hand, could be reduced through mitigation measures (see below).

The consequences of the previously discussed effects on pronghorn would be to reduce their abundance. The greatest reduction would be during construction. This in turn would reduce recreational opportunities such as hunting and nonconsumptive uses (e.g., photography and observation) in a similar manner. Since pronghorn are a game animal and source of income in the potential deployment area, any measureable decrease in abundance is very likely to be perceived by many people as a significant impact, even if it is of short duration.

The effects of construction activities are generally unavoidable because they result largely from pronghorn behavior, which cannot be easily modified. Pronghorn have habituated to some types of human disturbances, but the increase due to project construction may exceed the existing tolerances. The effects of people are largely avoidable or could be mitigated by the actions described below.

Predicted impacts and their significance are summarized in Table 4.3.1.6-3 fo. each county in which project elements would be deployed for this option. This shows that impacts are likely to occur in 12 of the 19 counties, but they are not likely to be significant.

Several mitigation measures could be taken to reduce or compensate for the adverse impacts described above.

- o Prohibit possession of firearms by construction workers while stationed in construction camps (during both work and off-duty hours).
- o Limit ORV use in pronghorn habitat areas subject to Air Force or BLM jurisdiction.

Clovis OB Impacts

The Clovis operating base is not in pronghorn range.

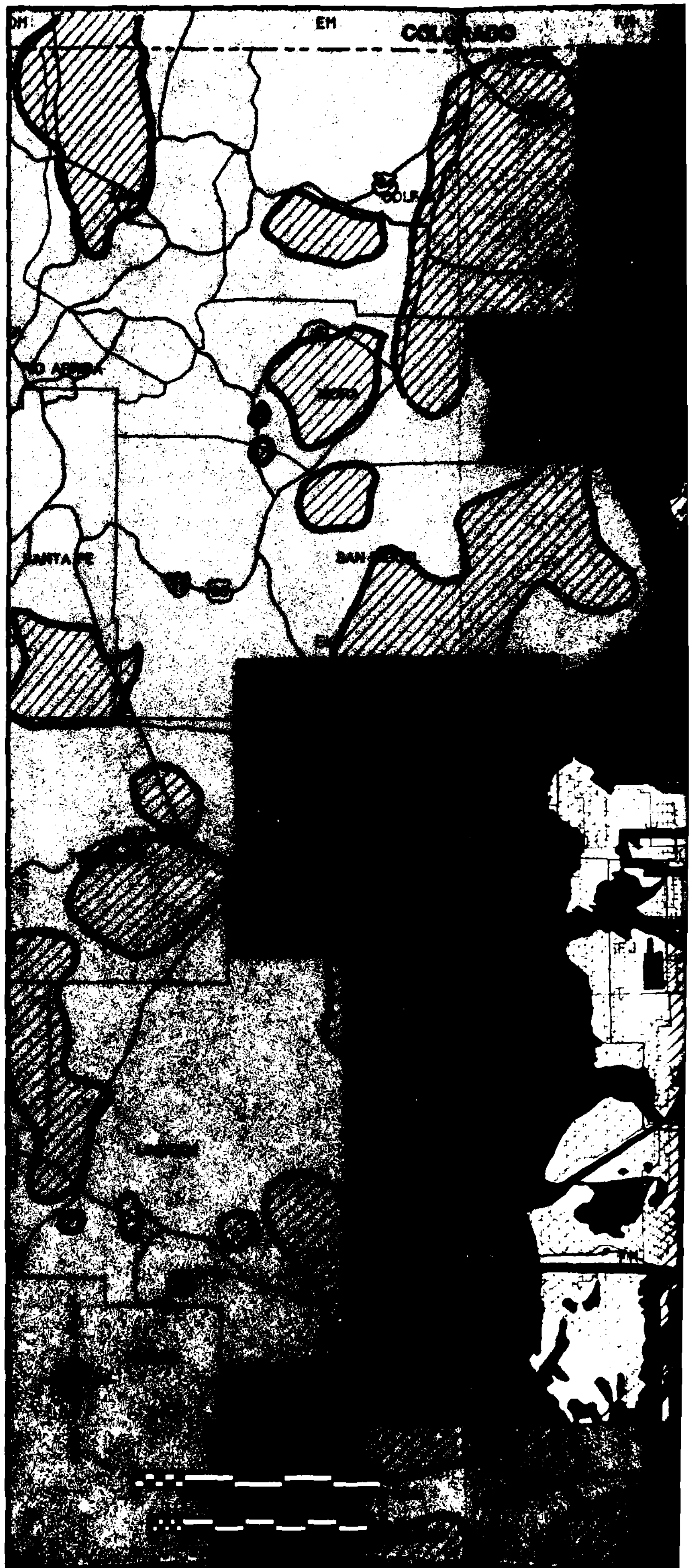
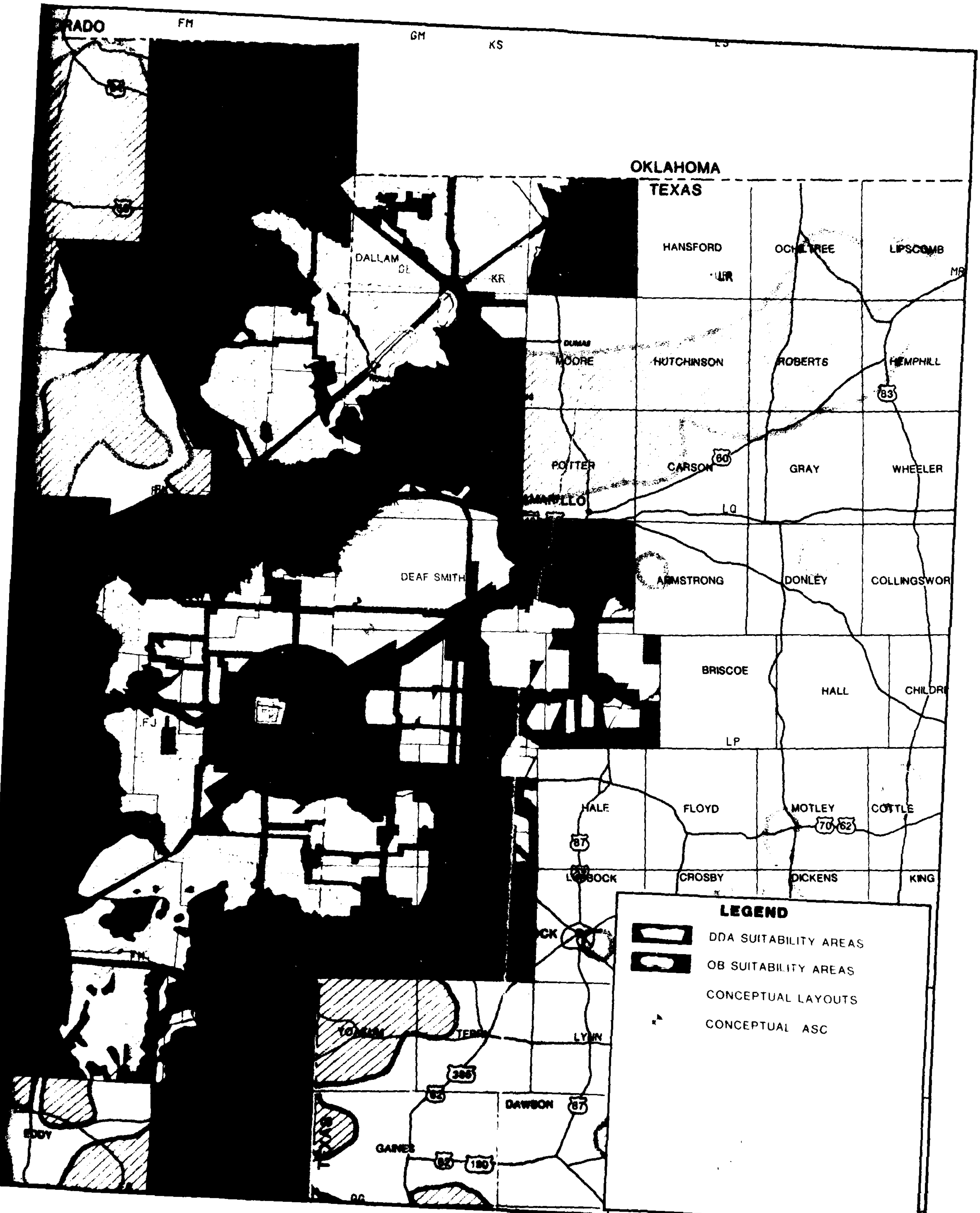


Figure 4.3.1.6-6. Distribution of pronghorn antelope and the conceptual project layout for Alternative 7.



OKLAHOMA
TEXAS
DALLAM
HANSFORD
OCHILTREE
LIPSCOMB
MOORE
HUTCHINSON
ROBERTS
HEMPHILL
POTTER
CARSON
GRAY
WHEELER
DEAF SMITH
ARMSTRONG
DONLEY
COLLINGSWOR
BRISCOE
HALL
HALE
FLOYD
MOTLEY
COTTLE
CROSBY
DICKENS
KING
LYNN
DAWSON
GAINES
EDDY
LEGEND
DDA SUITABILITY AREAS
OB SUITABILITY AREAS
CONCEPTUAL LAYOUTS
CONCEPTUAL ASC

3234-D

Table 4.3.1.6-3. Potential impact to pronghorn resulting from construction and operation of M-X DDA for Alternative 7.

COUNTY	ABUNDANCE INDEX[1]	SHORT-TERM % RANGE LOSS	SHORT-TERM ESTIMATED OVERALL IMPACT[3]	LONG-TERM % RANGE LOSS	LONG-TERM ESTIMATED OVERALL IMPACT
Counties with M-X Clusters and DTN					
Bailey, TX		0		0	
Castro, TX		0		0	
Cochran, TX		6		1	
Dallam, TX		25		3	
Deaf Smith, TX[2]		20		6	
Hartley, TX[2]		15		2	
Hockley, TX		0		0	
Lamb, TX		0		0	
Oldham, TX		4		1	
Parmer, TX		0		0	
Randall, TX		0		0	
Sherman, TX		0		0	
Swisher, TX		0		0	
Chaves, NM		7		1	
Curry, NM[2]		20		7	
DeBaca, NM		4		1	
Guadalupe, NM		0		0	
Harding, NM		15		1	
Lea, NM		0		0	
Quay, NM		9		1	
Roosevelt, NM[2]		25		2	
Union, NM		9		1	
Overall Alternative Impact		10		1	

3829-2

[1,3]
No impact. (No range or key habitat present for Abundance Index.)
Moderate impact. (Range present for Abundance Index.)
High (significant) impact. (Key habitat present for Abundance Index.)

[2]Conceptual location of Area Support Center (ASC).

[3]Loss of any key habitat or more than 50 percent of range in county is considered significant (High impact). Loss of 26-50 percent range in a county is considered moderate, and loss of 25 percent or less of range in a county is considered insignificant (No impact).

Dalhart OB Impacts

The Dalhart OB (Figure 4.3.1.6-7) is in pronghorn range, and near the Canadian Breaks, where significant pronghorn populations occur in the extensive rangeland. However, the land dedicated to the OB is farmland, and no pronghorn are present in the immediate vicinity, so no significant direct effects are expected. Similarly, as the surrounding lands are privately held and hunting is strictly regulated, no significant indirect effects are expected (Table 4.3.1.6-2).

ALTERNATIVE 8 (4.3.1.6.10)

Alternative 8 and pronghorn distrubution are shown in Figures 4.3.1.6-8 and 4.3.1.6-9. Only one OB would be necessary in each basing area for this alternative, at Coyote Spring and Clovis. Deploying half the project in Nevada and Utah would reduce the number of hydrologic subunits containing project elements approximately 40 percent. The areas of highest pronghorn abundance (Snake, Pine, Spring, and Hamlin valleys) are still within the project area, while 8 of the 24 hydrologic subunits used in split basing are not inhabited by pronghorn. The direct and indirect effects of project deployment would be the same as described above for the Proposed Action.

In Texas and New Mexico, the overall project area is also reduced by about half, but the split-basing deployment concentrates clusters in rangeland. Thus, 79 of the 100 clusters are placed in pronghorn range in Dallam, Hartley, Oldham, Deaf Smith, and Cochran Counties, Texas, and Union, Harding, Quay, Roosevelt, Curry and Chaves counties, New Mexico, the same counties involved in full basing.

DDA Impacts

Deployment of the DDA necessary for basing half the project in Nevada and Utah and half in Texas and New Mexico could affect pronghorn through construction activities, water use (Nevada/Utah only) and recreation activities of construction workers as discussed for the Proposed Action and Alternative 7. The potential for combined effects of M-X and other projects planned for the Nevada/Utah study area would be reduced since the Anaconda Moly project and all but the northern White River Valley potential site for WPPP would be outside the deployment area. Interactions with Alunite, Pine Grove Moly, IPP and Allen Warner could still occur. No other significant projects are planned for the Texas and New Mexico area.

Time dependent effects of project implementation on pronghorn would be the same as described for the Proposed Action and Alternative 7.

The effects of M-X construction on short-term productivity of pronghorn will be similar to that described under the Proposed Action and Alternative 7. In Nevada and Utah, the reduction in productivity, however, will occur in fewer valleys. Areas that would likely have measureable reductions in short-term productivity for full basing but not for split basing, include Antelope, Stone Cabin, Kobeh, Fish Springs, and Dugway valleys (hydrologic subunits). In Texas and New Mexico, due to the concentration of clusters in pronghorn range, the effects would be similar to those discussed in Alternative 7 in both quality and quantity in all but Cochran and Dallam counties, where there would be less population reduction.

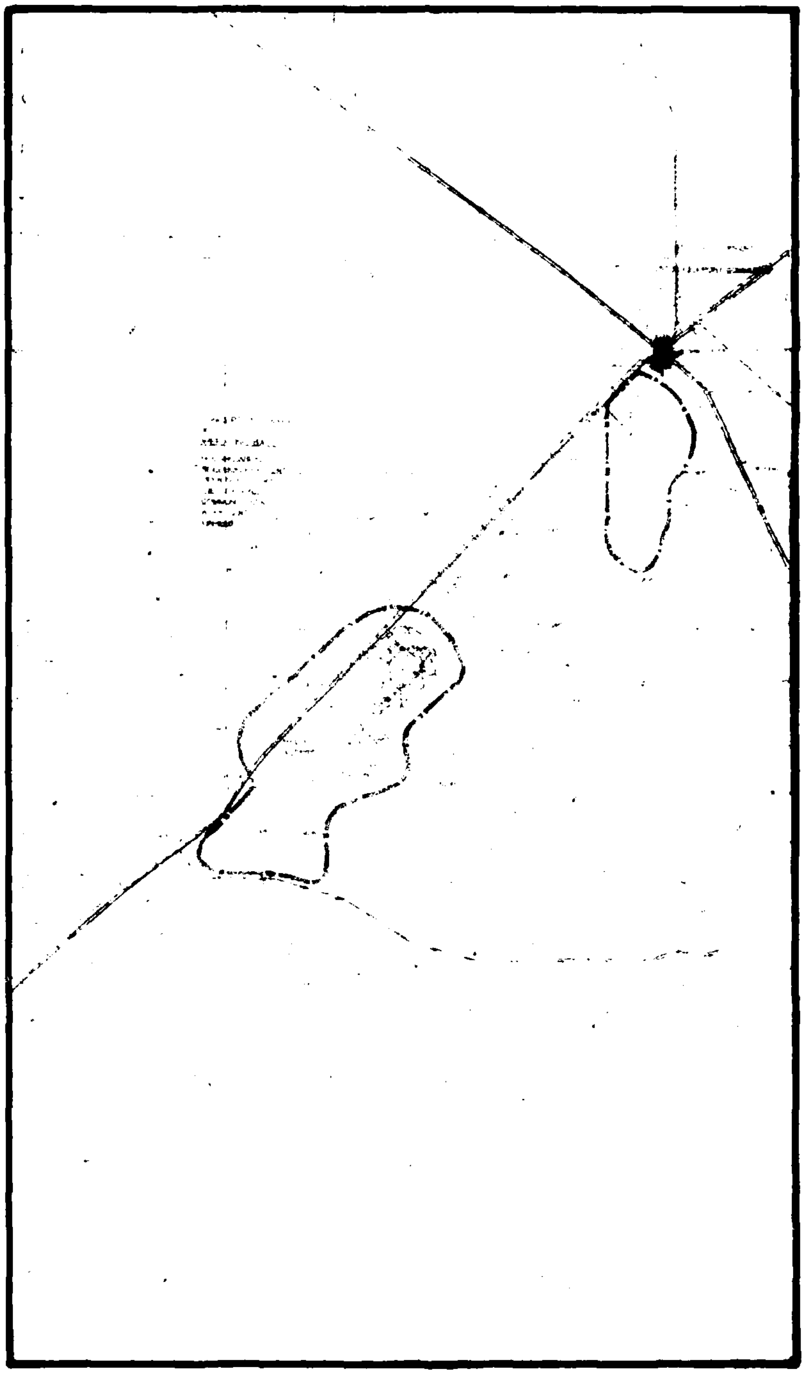


Figure 4.3.1.6-7. Pronghorn distribution in the vicinity of Dalhart, Alternatve 7.

The small amount of pronghorn habitat permanently lost represents an irreversible and irretrievable commitment of resources. Loss of animals on the other hand could be replaced through mitigation measures.

The consequences of project-related effects on pronghorn are the same as those described for the Proposed Action and Alternative 7.

Predicted impacts and their significance are summarized in Table 4.3.1.6-4 for each hydrologic subunit or county in which project elements would be deployed for split basing. In Nevada/Utah, significant impacts are predicted for 14 of the 24 hydrologic subunits containing project elements. Eight of the ten remaining hydrologic subunits are not inhabited by pronghorn, and no significant impacts are expected in Penoyer and Little Smoky Valleys (#170 and 155c). Loss of key habitat was the reason for significant impact in all subunits. Long-term effects are the same as discussed for full basing. In Texas/New Mexico, all the counties affected by full basing would be affected in split basing, with indirect effects reduced in Cochran and Dallam counties only. Otherwise, both indirect and direct effects would be as described in Alternative 7.

Mitigation measures that would reduce or compensate for the significant adverse impacts are the same as those listed for the Proposed Action and Alternative 7.

OB IMPACTS

Potential impacts to pronghorn in the vicinity of the Coyote Spring and Clovis OB sites would be the same as discussed for the Proposed Action and Alternative 7. These are summarized in Table 4.3.1.6-2.

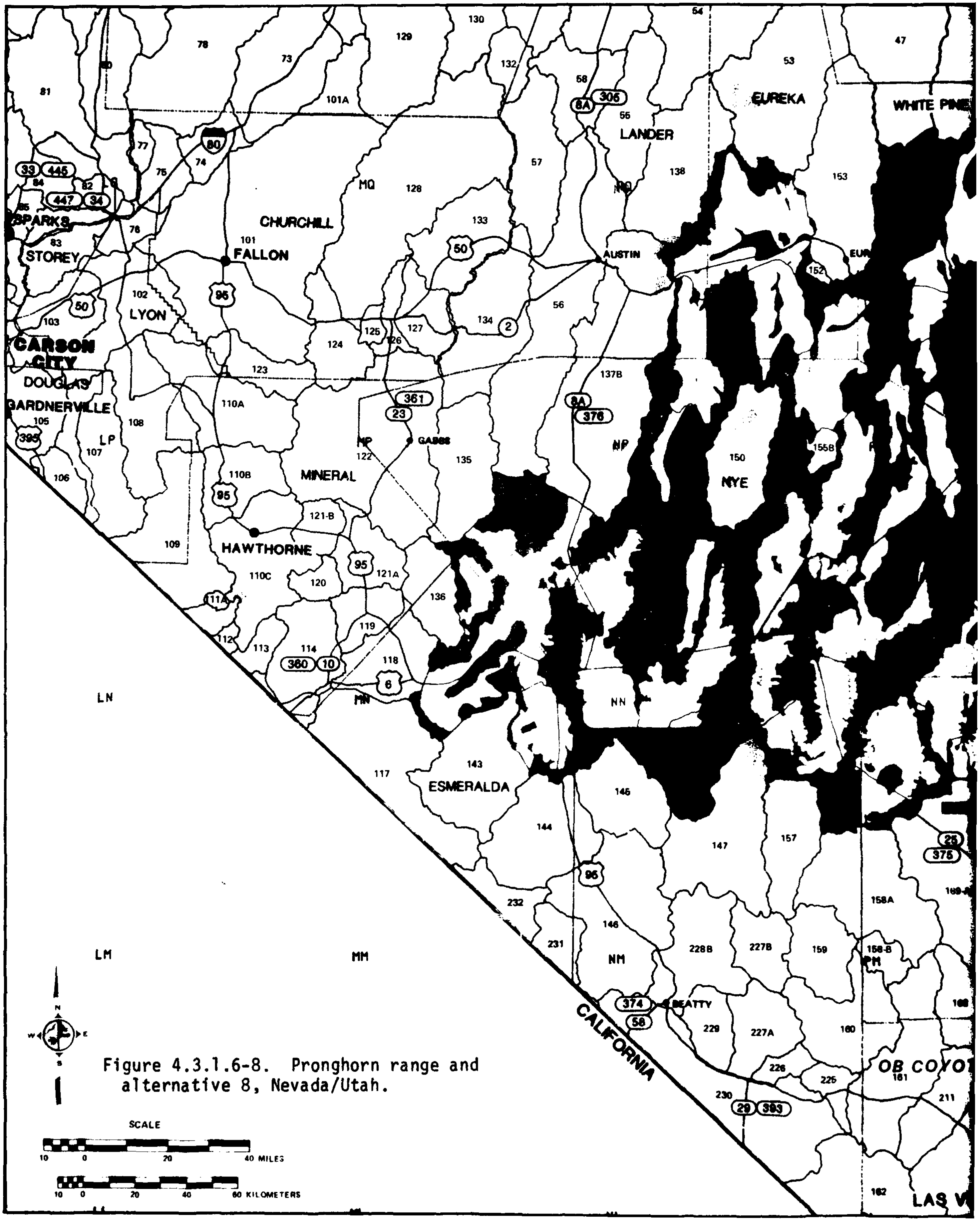
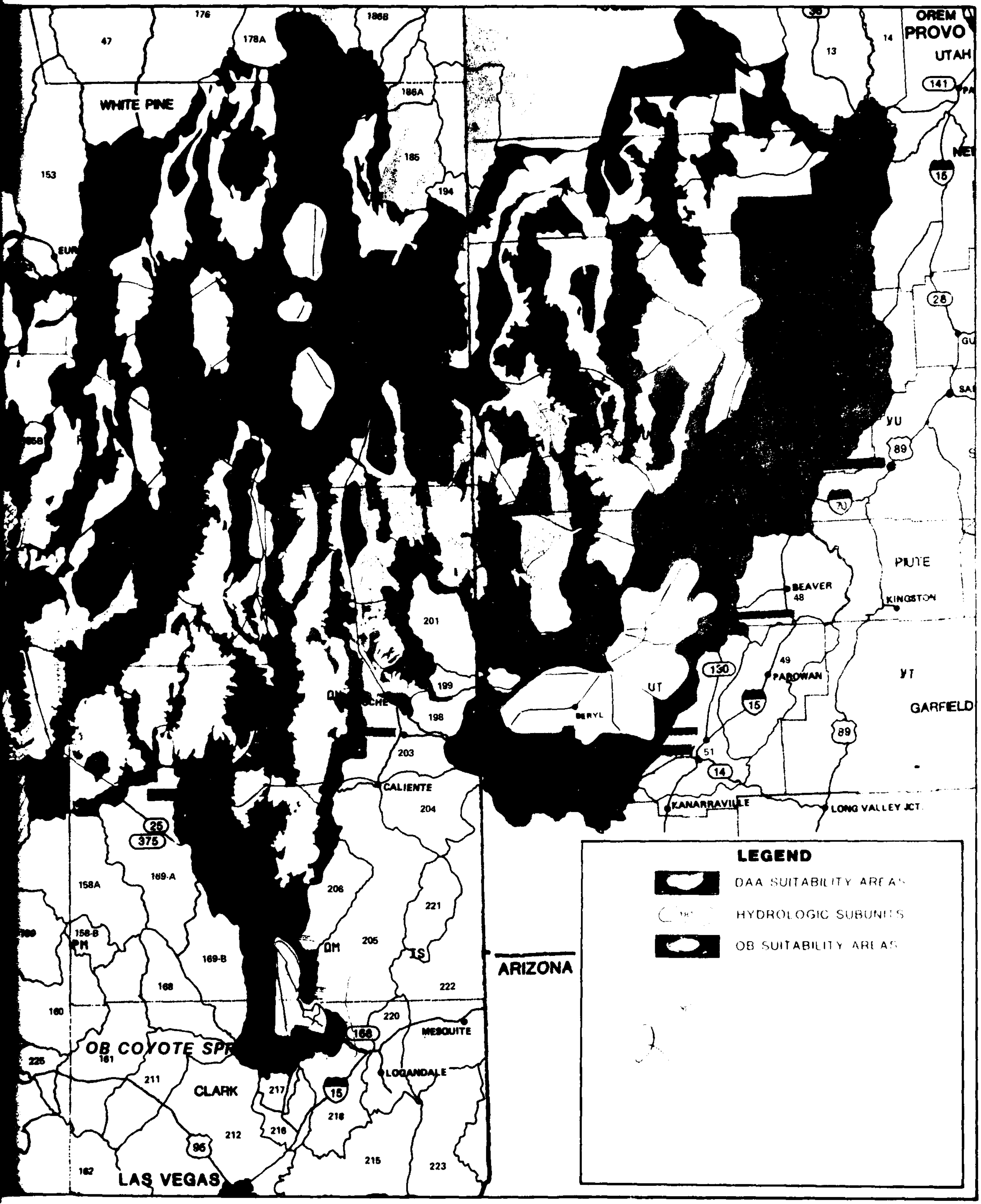


Figure 4.3.1.6-8. Pronghorn range and alternative 8, Nevada/Utah.


WHITE PINE
OREM
PROVO
UTAH
PIUTE
BEAVER
KINGSTON
PAROWAN
GARFIELD
BERYL
CALIENTE
KANARRAVILLE
LONG VALLEY JCT.
ARIZONA
MESQUITE
LOGANDALE
OB COYOTE SPR
CLARK
LAS VEGAS
LEGEND
DAA SUITABILITY AREAS
HYDROLOGIC SUBUNITS
OB SUITABILITY AREAS

3222 D

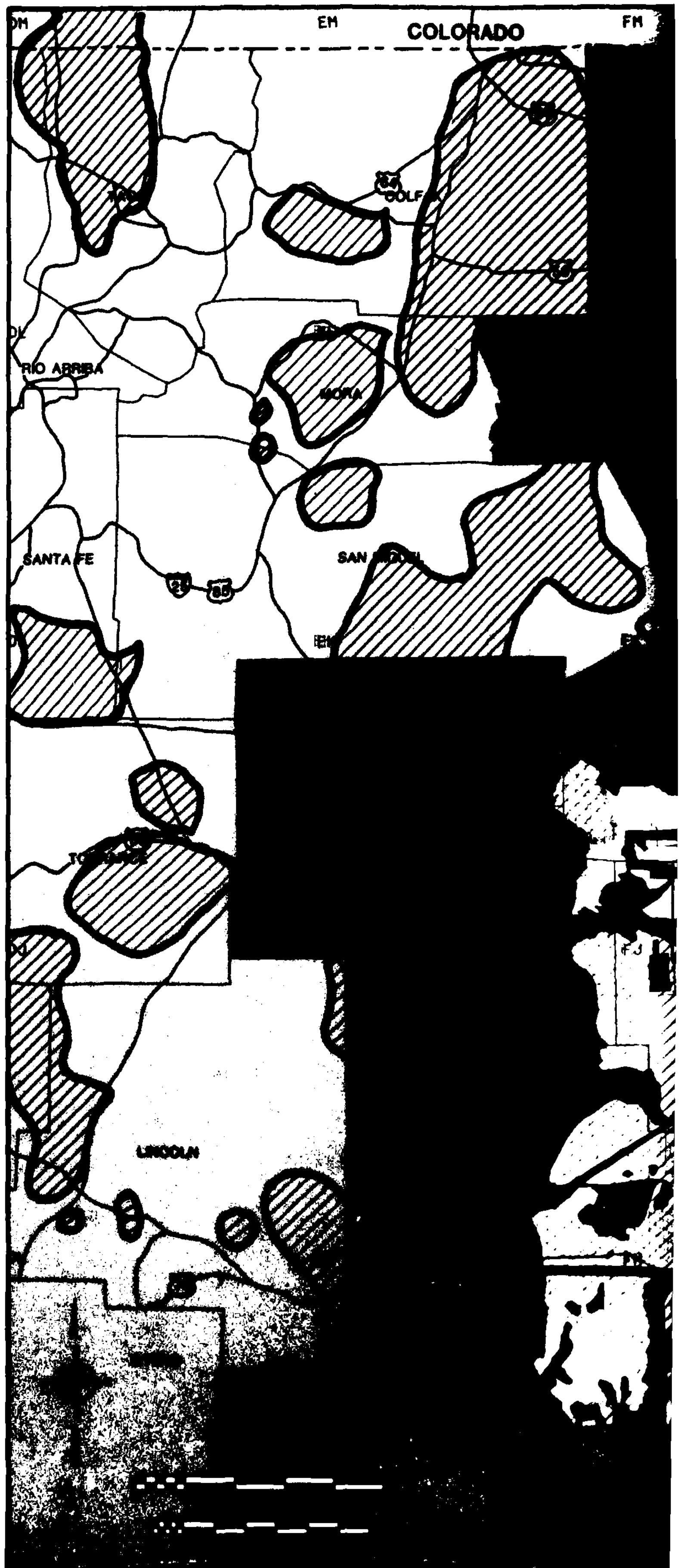
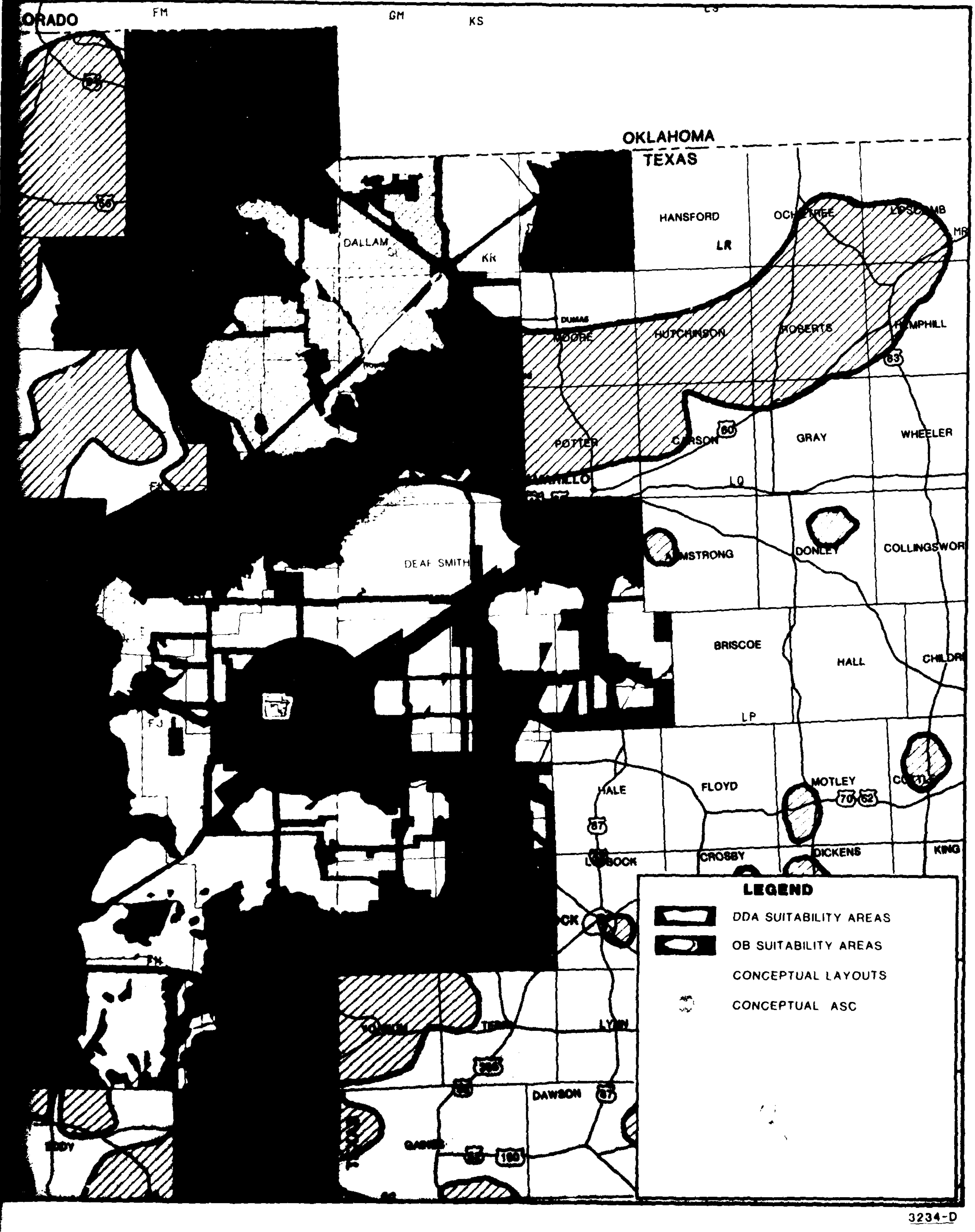


Figure 4.3.1.6-9. Distribution of pronghorn antelope and the conceptual project layout for Alternative 8, split basing Texas/New Mexico.


OKLAHOMA
TEXAS
DALLAM
HANSFORD
OCHILTREE
LIPSCOMB
MOORE
DUMAS
HUTCHINSON
ROBERTS
HEMPHILL
POTTER
CARSON
GRAY
WHEELER
AMARILLO
DEAF SMITH
ARMSTRONG
DONLEY
COLLINGSWOR
BRISCOE
HALL
HALE
FLOYD
MOTLEY
CROSBY
DICKENS
KING
DAWSON
LEGEND
DDA SUITABILITY AREAS
OB SUITABILITY AREAS
CONCEPTUAL LAYOUTS
CONCEPTUAL ASC

3234-D

Table 4.3.1.6-4. Potential impact to pronghorn in Nevada/Utah and Texas/New Mexico DDAs for Alternative 8.

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE INDEX[1]	SHORT-TERM EFFECTS			LONG-TERM EFFECTS		
			% HABITAT LOSS[4]		ESTIMATED OVERALL IMPACT[3]	% HABITAT LOSS		ESTIMATED OVERALL IMPACT[3]
NO.	NAME		RANGE	KEY		RANGE	KEY	
	Subunits or Counties with M-X Clusters and DTN							
4	Snake[2]		10	15		1	1	
5	Pine		25	65		1	2	
6	White		0	10		0	1	
7	Fish Springs		0	4		0	1	
46	Sevier Desert		7	20		1	1	
46A	Sevier Desert – Dry Lake[2]		25	25		1	1	
54	Wah Wah		95	50		2	1	
155C	Little Smoky—Southern		4	0		1	0	
156	Hot Creek		60	95		2	1	
170	Penoyer		0	0		0	0	
171	Coal		0	0		0	0	
172	Garden		0	0		0	0	
173A	Railroad—Southern		60	55		1	1	
173B	Railroad—Northern		10	25		1	1	
180	Cave		0	0		0	0	
181	Dry Lake[2]		0	0		0	0	
182	Delamar		0	0		0	0	
183	Lake		60	85		1	1	
184	Spring		2	10		1	1	
196	Hamlin		40	80		1	2	
202	Patterson		80	45		1	1	
207	White River		0	0		0	0	
208	Pahroc		0	0		0	0	
209	Pahranagat		0	0		0	0	
	Bailey, TX		0	0		0	0	
	Cochran, TX		4	0		1	0	
	Dallam, TX		20	0		2	0	
	Deaf Smith, TX		20	0		6	0	
	Hartley, TX[2]		15	0		2	0	
	Hockley, TX		0	0		0	0	
	Lamb, TX		0	0		0	0	
	Oldham, TX		4	0		1	0	
	Parmer, TX		0	0		0	0	
	Chaves, NM		7	0		1	0	
	Curry, NM		20	0		7	0	
	DeBaca, NM		3	0		1	0	
	Guadalupe, NM		0	0		0	0	
	Harding, NM		15	0		1	0	
	Lea, NM		0	0		0	0	
	Quay, NM		9	0		1	0	
	Roosevelt, NM[2]		25	0		2	0	
	Union, NM		9	0		1	0	
	Overall Nevada/Utah		15	21		1	1	
	Overall Texas/New Mexico		10	0		1	0	
	Overall Alternative 8							

3828-1

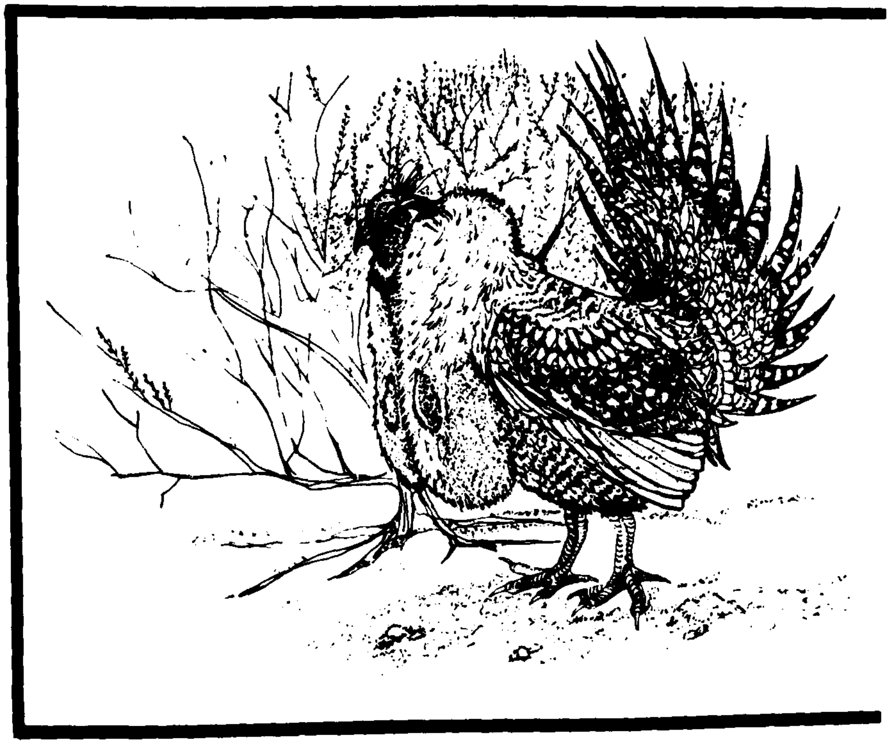
[1]
- No impact. (No range or key habitat present for Abundance Index.)
- Moderate impact. (Range present for Abundance Index.)
- High (significant) impact. (Key habitat present for Abundance Index.)

[2]Conceptual location of Area Support Center (ASC).

[3]Loss of any key habitat or more than 50 percent of range in hydrologic subunit or county is considered significant. Loss of 26-50 percent range is considered moderate and loss of under 26 percent of range in a hydrologic subunit or county is considered insignificant. Any key habitat loss remaining after construction could cause a moderate impact.

[4]Habitat loss during construction. This includes a 1 mile (1.6 km) avoidance zone around all construction activities.

Sage Grouse



SAGE GROUSE

INTRODUCTION (4.3.1.7.1)

The sage grouse is distributed throughout the western U.S. It is distinguished by its dependence upon sagebrush vegetation and the congregation of males at strutting grounds (leks) during the breeding season to perform courtship displays. Much of the sage grouse key habitat (i.e., leks, brood use areas, and wintering grounds) in the study area is found in the valley bottoms and bajadas. The sage grouse is a highly valued game species whose range overlaps the M-X geotechnically suitable area. During the 1978 hunting season in Nevada, 6,647 hunters, approximately 1 percent of the state population, harvested 17,693 sage grouse. In past years, the number of hunters in the field has exceeded 9,000 (e.g., 9,180 in 1970 and 9,348 in 1974), with over 23,000 grouse harvested (Molini and Barngrover, 1979).

Potential significant project impacts were identified by combining distributional information with project information.

PROPOSED ACTION (4.3.1.7.2)

DDA Impacts

Figure 4.3.1.7-1 shows the relationship between project configuration and sage grouse range and key habitat. Key habitat is defined as habitat which is necessary for the survival of a sage grouse population, that is, strutting grounds, brood-use areas, and wintering grounds. Because many areas of the Great Basin have not been adequately surveyed for key habitat, the amount of key habitat listed in this discussion should be considered the minimum present.

The potential effects of M-X deployment on sage grouse fall into three major categories: loss of habitat, surface water depletion, and effects of increased human population. Habitat loss would consist of direct loss of vegetation through scarification or through behavioral avoidance of areas of construction or recreation (e.g., ORV and camping areas). Sage grouse populations tend to be closely associated with one or a small cluster of leks, areas traditionally used for communal courtship and breeding. Very little movement occurs between leks (Molini, 1980).

Therefore, if a lek is removed or if sage grouse abandon a lek because of their intolerance of adjacent disturbance, that population has a high likelihood of being lost. Through field observation and knowledge of sage grouse behavior, the Department of Wildlife in Nevada has estimated that construction activities and use of major roadways during construction would have an effect radius of approximately one mile (line-of-sight) (Molini, Nevada DOW 1980). Any key habitat within a one mile radius of construction activity or high human activity has a high likelihood of being abandoned (Molini, 1980). Initially, noise, construction activity, and the presence of people are expected to have a major negative effect, although some acclimation may occur with time.

Reduction or loss of surface or groundwater will have a major effect in valleys where springs and wet meadows dry up as a result. Sage grouse depend upon these mesic areas for successful rearing of their broods. Effects from increased human populations are primarily through increased hunting activity (legal and illegal) and habitat loss due to behavioral avoidance of human activity.

Sage grouse habitat quality fluctuates from year to year in the Great Basin due to variation in climatic conditions (e.g. precipitation, temperature) and such disturbances as livestock grazing and human activity. Therefore, the effects of M-X could be compounded or lessened during a particular year depending upon climatic conditions or other non-M-X related disturbances. However, all effects ultimately result in a loss of habitat, a reduction of habitat quality, or a direct reduction in population. Habitat loss or reduction in quality eventually influences the size or vigor of the population through reduction in carrying capacity.

Other projects planned for, proposed, or approved in the region will affect sage grouse, but major effects of these projects is expected to be localized. Large-scale projects proposed for the region include Intermountain Power Project (IPP), White Pine Power Project (WPPP), Pine Grove Molybdenum Mine and Anaconda Nevada Molybdenum Project. None of these projects are expected to have the overall widespread effects on sage grouse that M-X deployment would have, or to add significantly to the effects of M-X in a cumulative sense. The localized effects that would be additive to M-X effects would be scarification and construction activities, plus the effects of increased human population. Localized M-X effects would be less than those of the proposed Anaconda-Nevada Molybdenum mine. The intensity of scarification and human activity from this mine would be much greater (permanent loss of 2,600 acres of vegetation) than in an area where M-X construction would take place. However, the number of sage grouse populations in the M-X deployment area likely to be affected by this mine is small compared to sage grouse populations potentially affected by M-X.

Direct impacts to known sage grouse habitat (Table 4.3.1.7-1) were estimated from the intersections of known sage grouse range and key habitat (leks, brood use areas, and wintering grounds) with project elements on 1:500,000 scale maps (1 in. = 4 mi). Data were obtained from the Nevada Department of Wildlife and Utah Division of Wildlife Resources.

Short-term (construction) effects involve both direct habitat disturbance and potential abandonment of key habitat up to 1 mi from construction sites. At the map scale used in this analysis, the size of both key habitat and construction sites is exaggerated, causing an overestimate of numbers of leks and brood use sites

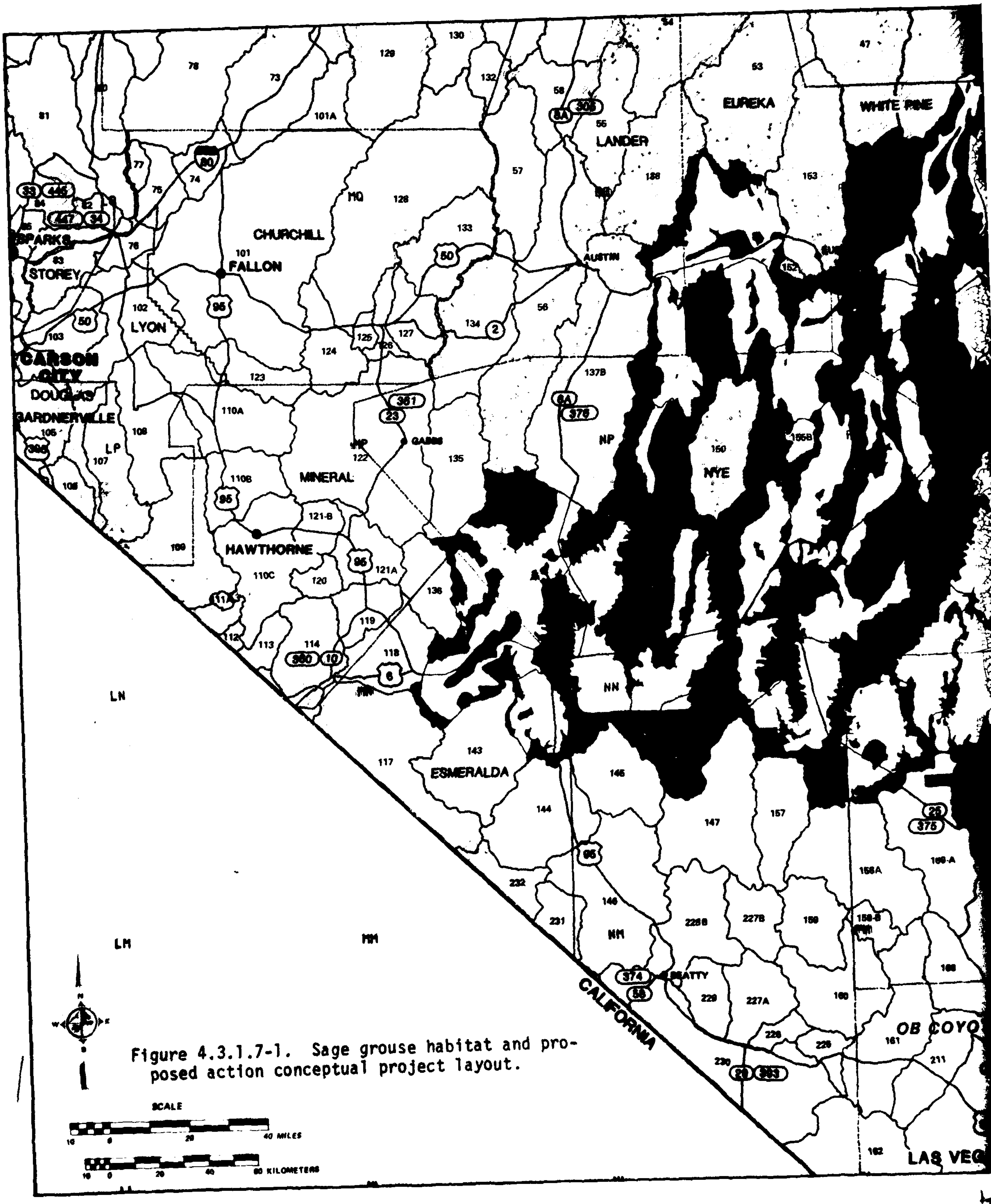
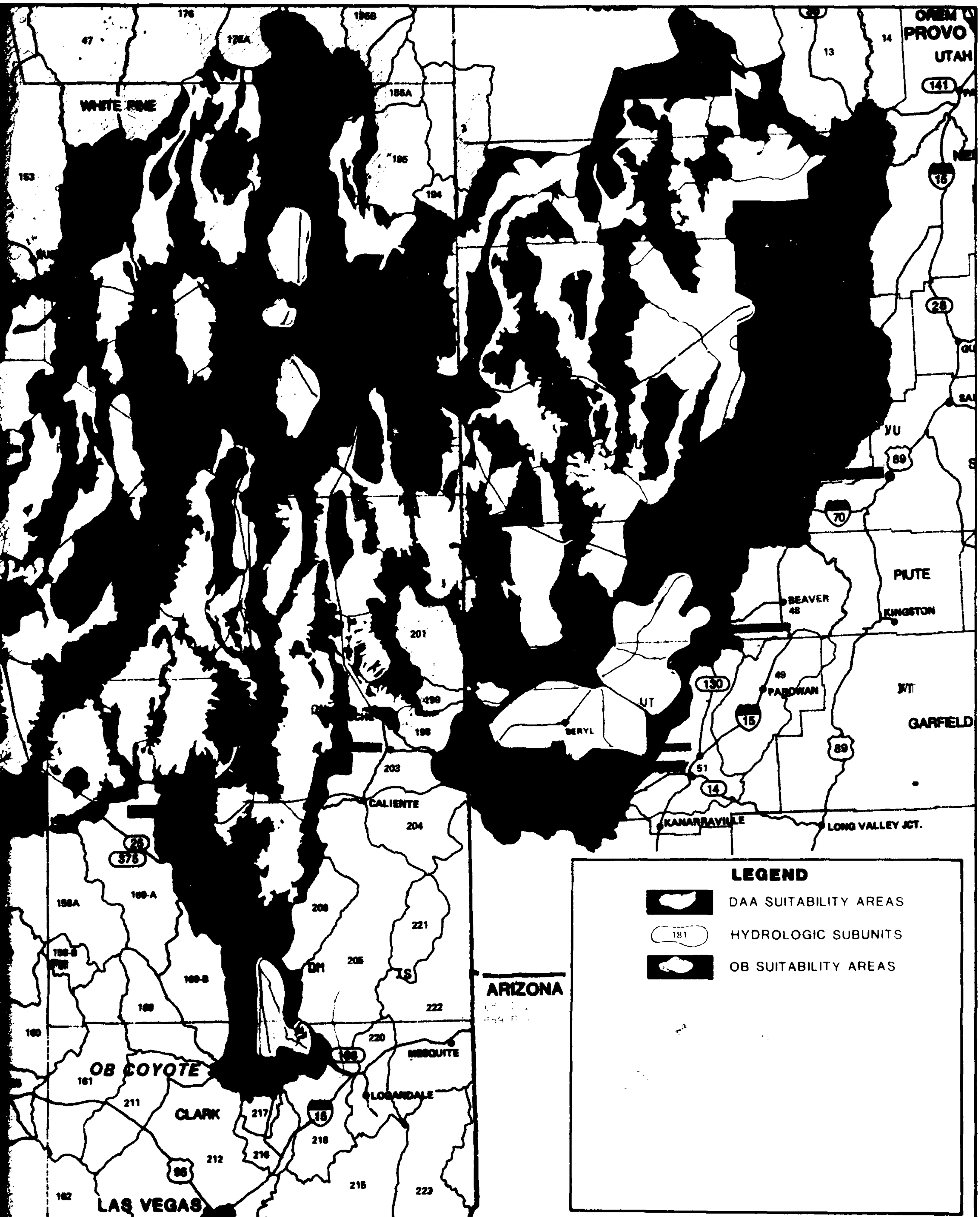


Figure 4.3.1.7-1. Sage grouse habitat and proposed action conceptual project layout.


PROVO
UTAH
WHITE PINE
CALIENTE
BEAVER
PIUTE
KINGSTON
PAROWAN
BERYL
GARFIELD
KANARRAVILLE
LONG VALLEY JCT.
ARIZONA
MESQUITE
LOGANDALE
OB COYOTE
CLARK
LAS VEGAS
LEGEND
DAA SUITABILITY AREAS
181
HYDROLOGIC SUBUNITS
OB SUITABILITY AREAS

3222-D

Table 4.3.1.7-1. Potential impact to sage grouse in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT		ABUNDANCE INDEX[1]	SHORT- AND LONG-TERM IMPACTS OF KNOWN SAGE GROUSE RANGE AND KEY HABITATS[2]				
NO.	NAME		% OF HYDRO-SUBUNIT RANGE DISTURBED	% OF LEK SITES DISTURBED	% OF BROOD-USE AREAS DISTURBED	% OF WINTERING GROUNDS DISTURBED	ESTIMATED SHORT- & LONG-TERM IMPACT[1,2]
	Subunits with M-X Clusters and DTN						
4	Snake		0	0	0	0	
5	Pine		2	0	0	0	
6	White		0	0	0	0	
7	Fish Springs		0	0	0	0	
8	Dugway		0	0	0	0	
9	Government Creek		0	0	0	0	
46	Sevier Desert		0	0	0	0	
46A	Sevier Desert & Dry Lake[3]		0	0	0	0	
54	Wah Wah		0	0	0	0	
137A	Big Smoky-Tonopah Flat		1	0	14	0	
139	Kobeh		1	45	26	2	
140A	Monitor—Northern		1	23	9	0	
140B	Monitor—Southern						
141	Ralston		0	0	0	0	
142	Alkali Spring		0	0	0	0	
148	Cactus Flat		0	0	0	0	
149	Stone Cabin[3]		1	0	0	0	
151	Antelope		2	100	1	0	
154	Newark[3]		1	15	0	0	
155A	Little Smoky—Northern		0	0	0	0	
155C	Little Smoky—Southern						
156	Hot Creek		0	0	0	0	
170	Penoyer		0	0	0	0	
171	Coal		0	0	0	0	
172	Garden		1	0	67	0	
173A	Railroad—Southern		3	0	8	0	
173B	Railroad—Northern						
174	Jakes		1	33	0	0	
175	Long		1	100	0	0	
178B	Butte—South		1	50	0	1	
179	Steptoe		0	0	0	0	
180	Cave		1	0	0	0	
181	Dry Lake[3]		0	0	0	0	
182	Delamar		0	0	0	0	
183	Lake		1	100	57	0	
184	Spring		1	0	0	0	
196	Hamlin		2	0	67	0	
202	Patterson		0	0	0	0	
207	White River[3]		1	0	0	0	
208	Pahroc		0	0	0	0	
209	Pahranagat		0	0	0	0	
	Overall DDA Impact		1%	22%	7%	1%	

3830-4

[1]
- No significant impact.
- Low abundance levels.
- Moderate impact or intermediate abundance levels.
- High impact or high abundance levels.

[3] Conceptual location of Area Support Center (ASC).

[2] Long-term impact is less than short-term impact by an undetermined amount (see text). This is a worst case analysis.

impacted. This allows for the short-term behavioral avoidance, but is probably an overestimate of direct impacts.

Long-term effects are assumed to be proportional to the key habitat area actually disturbed by the project and thus would be lower than for short-term effects in which behavioral avoidance is a factor. Because of the overestimates introduced by the analysis map scale, long-term effects must be considered a worst-cause estimate.

Table 4.3.1.7-1 indicates sage grouse abundances and potential impact significance for the 33 hydrologic subunits in the M-X deployment area known to contain sage grouse range. Of these, 21 would have direct loss of habitat due to the construction of shelters, roadways, and associated developments. The maximum percentage of sage grouse habitat directly removed in any hydrologic subunit is less than 5 percent, and most watersheds show less than 2 percent habitat lost. Key habitat would be lost in 12 watersheds.

The Kobeh hydrologic subunit is the most heavily affected by M-X deployment in terms of loss of key habitat. It is used in this discussion to illustrate potential project-induced changes in sage grouse populations and productivity with time. During the construction phase of the project, 13 of 29 leks, 5 of 18 brood-use areas, and 163 acres of wintering grounds in the Kobeh hydrologic subunit would be directly removed by shelter and road construction. In addition, human activity in the area would increase by an estimated 1,752 people in 1988 due to the presence of a construction camp (#18). Behavioral avoidance of previously used habitat would be greatest during this time and may increase effective habitat loss several times over the area actually scarified.

Within the first two years of project construction and operation, sage grouse abundance in the Kobeh hydrologic subunit might be expected to decrease 30 to 50 percent because of the 45 percent reduction in lek sites and 28 percent reduction in brood-use areas. Many shelters and roadways criss-cross the one wintering ground essential for winter survival, and the effective loss of this habitat for sage grouse may be greater than the 163 acres directly removed. After the first year of disturbance, sage grouse may recover slightly if behaviorally avoided key habitat again becomes available. Sage grouse have been known to use leks adjacent to disturbed areas (Higby 1969). Because of the large long-term loss of key habitat, however, sage grouse abundance may not recover in the forseeable future above 50-60 percent of current abundance. Revegetation of scarified key habitat areas would take on the order of 30 to 50 years, and hence would not be available for the original sage grouse populations.

Short-term productivity is expected to be only 50-70 percent of current productivity because of loss of key habitat and the presence of human activity associated with the construction camp. Long-term productivity is also likely to be in the 50-70 percent range because most of the key habitat loss would be permanent.

Loss of key habitat due to scarification or intense human activity is, in most cases, an irretrievable loss of resources required by sage grouse for survival. In some cases, and with intensive management, key habitat may be retrievable. Much of the habitat lost because of behavioral intolerance of construction-associated disturbances such a noise, traffic, and people could in many cases be recovered if managed properly.

Sage grouse are considered by state wildlife agencies within the Great Basin as a significant resource which is highly specialized, very dependent upon sagebrush vegetation, and sensitive to environmental disturbance. The Nevada Department of Wildlife considers any loss of key habitat a significant impact (Molini, 1980). Direct removal of key habitat in 12 hydrologic subunits would have significant impacts on sage grouse. Many key habitat sites probably are not currently mapped, and M-X construction may be found to have significant impacts in other hydrologic subunits after more information is collected.

Avoidance of key habitat areas offers significant potential for avoiding or reducing effects on sage grouse. One potentially effective measure for reducing the level of effects would be to stake out shelter and road locations during the spring when sage grouse leks are active and most easily detected. An alternate method would be to accurately map the lek and brood-use locations during spring (perhaps by air), and stake the shelters later. Lek and brood-use areas are usually small (1 to 10 acres), and could be avoided by minor adjustments in siting of the individual shelters in the field. Such avoidance would effect significant mitigation. A prohibition of firearms in construction camps and on the construction sites would reduce the effect of illegal harvest and harassment. Prohibition or tight restrictions on ORV activity and camping sites would avoid destruction of key habitat. The usefulness of these measures, however, would depend on strict law enforcement.

Disturbed key habitat may be improved or restored through management techniques. Exclusion of cattle from key habitat areas during pertinent times of the year may benefit sage grouse by reducing habitat destruction or degradation. In those areas where sage grouse populations are lost due to their behavioral avoidance of M-X construction activities, transplanting of grouse back into these areas may be successful. Development of new water sources as a result of M-X construction needs has the potential to create new wet meadow habitat which could be used as brood-use habitat if located within 2 mi of a lek.

Coyote Spring Valley OB Impacts

No sage grouse occur in the vicinity of the Coyote Spring OB, and no significant adverse impacts to sage grouse are expected to result from OB construction or operation.

Milford OB Impacts

No direct loss of sage grouse habitat would result from construction of a base site southwest of Milford (Figure 4.3.1.7-2). Over 4,200 acres of habitat could be lost to sage grouse though, if the base is moved to the northeast part of the suitability envelope. Increased exploitation (both legal and illegal) is also likely to affect the population of sage grouse located near Minersville, Utah. Because of a substantial increase in the human population in the area (estimated at approximately 13,000 people for the life of this project), sage grouse are expected to be negatively affected by increased recreation, particularly off-road vehicle (ORV) use. Many investigators have found that destruction of sagebrush near a strutting ground can severely reduce sage grouse use of the strutting ground or cause its abandonment altogether. These effects are expected to last throughout the operations phase of the project. ORV use can be expected to be very high within 3 mi of the base (Rajala, 1980), and would be particularly harmful to sage grouse if the base is

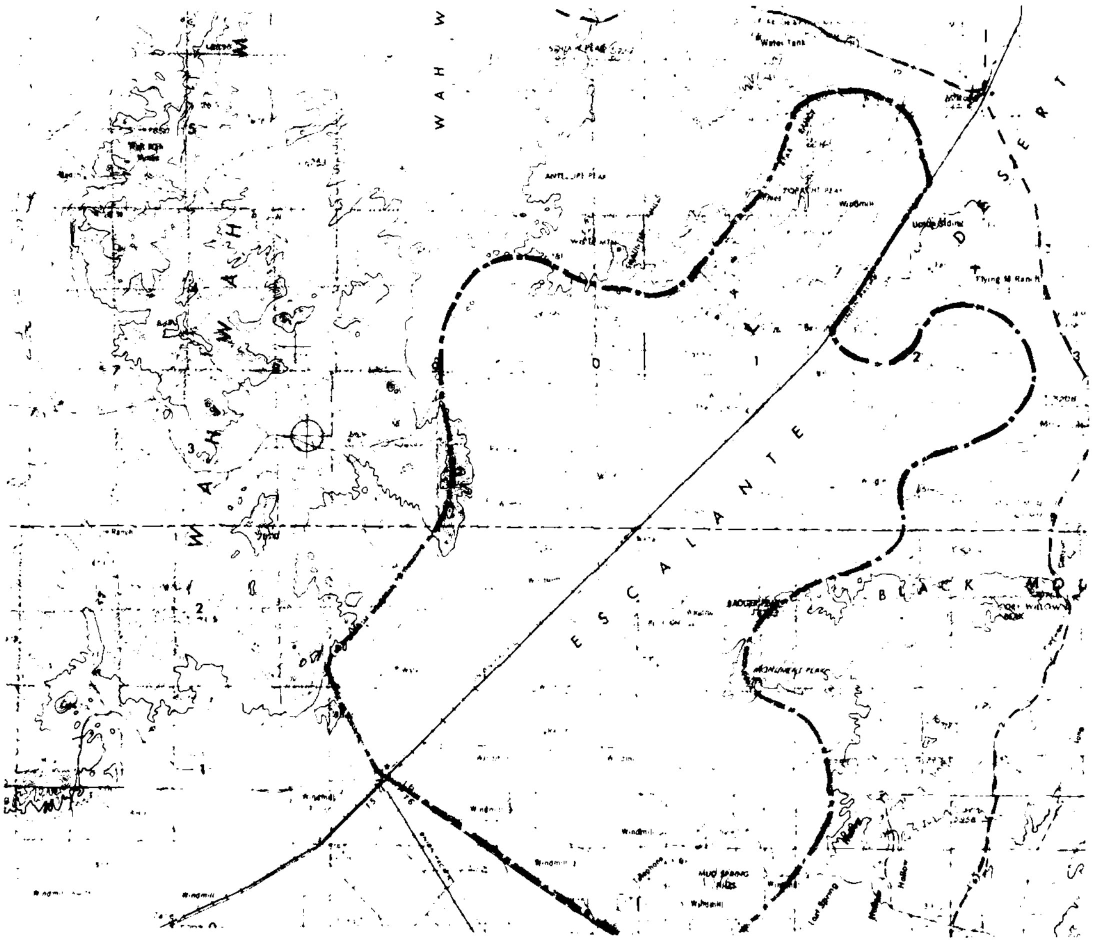


Figure 4.3.1.7-2. Distribution of sage grouse in the Milford OB vicinity.

located in the northeast part of the envelope, directly in sage grouse habitat. Productivity for this area is expected to be lowered even after project decommissioning. Productivity of sage grouse is tied largely to the quality of the sagebrush in their habitat, and recovery of sagebrush is expected to take 50-75 years.

Direct impacts are avoidable if the base is not sited in the northeast part of the envelope. Both of the recreational impacts are avoidable. Areas known to have sage grouse could be posted to prohibit ORV activity, and patrols could be started in sage grouse areas to monitor ORV use and illegal harvesting. Limitation of human activities in these areas during the months encompassing courtship, nesting, and brood rearing would help ensure reproductive success.

Table 4.3.1.7-2 compares the effects on sage grouse of the OBs for the Proposed Action with those for alternatives 1 through 4. Milford has significant indirect effects on sage grouse in four hydrologic subunits, while Coyote Spring has minimal overall impacts. The overall indirect effect of the OBs for the Proposed Action would be moderate.

ALTERNATIVE 1 (4.3.1.7.3)

The impacts for the DDA and Coyote Spring OB are the same as those for the Proposed Action. The location of an OB at Beryl is likely to result in some adverse indirect impacts on sage grouse because of a significant increase in population (approximately 13,000 people during operations) in a presently sparsely populated area. Sage grouse occur in both southern Pine and Hamlin hydrologic subunits to the north of this base (Figure 4.3.1.7-3). These areas would most likely receive the bulk of sage grouse hunters (both legal and illegal) and other human activities, such as ORV use. The resulting reduction of sage grouse numbers could be substantial if ORV use is high. These effects would be long-term and would lower the productivity of the population at least in the Pine and Hamlin hydrologic subunits.

The overall impact of the Beryl OB would be moderate. Sage grouse areas are approximately 15-20 mi from the OB and will probably not receive heavy ORV use. Increased legal hunting should not greatly reduce sage grouse numbers because grouse, like quail, are much more dependent on habitat quality for population stability.

As noted for the Proposed Action, the Coyote Spring OB would have minimal negative effects to sage grouse, but the Beryl OB would have significant negative impacts in five hydrologic subunits. Table 4.3.1.7-2 indicates that the overall impact of the two OBs under Alternative 1 is moderate. Mitigation measures would be the same as for the Proposed Action.

ALTERNATIVE 2 (4.3.1.7.4)

The impacts for the DDA and Coyote Spring OB are the same as those for the Proposed Action. An OB at Delta is expected to have few impacts on sage grouse. Sage grouse occur approximately 30 mi northwest of the base site in the Sheeprock Mountains and about 80 mi northwest in the Deep Creek Mountains. Hunting may increase in these areas, particularly in the Deep Creek Mountains, because of their natural beauty and attractiveness, but this is not expected to be significant. Only

Table 4.3.1.7-2. Potential overall impact to sage grouse which could result from construction of operating bases for the Proposed Action and Alternatives 1-4.

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE INDEX[1]	ESTIMATED OVERALL IMPACT[1]				
			PROPOSED ACTION	ALT. 1	ALT. 2	ALT. 3	ALT. 4
NO.	NAME		COYOTE SPRING, MILFORD	COYOTE SPRING BERYL	COYOTE SPRING DELTA	BERYL ELY	BERYL COYOTE SPRING
	Subunits or Counties within OB Suitability Area						
46	Sevier Desert	No	No	No	No	No	No
50	Milford[2,3]	High	High	No	No	No	No
52	Lund District	No	No	No	No	No	No
53	Beryl-Enterprise	No	No	No	No	No	No
179	Steptoe	High	No	No	No	High	No
210	Coyote Spring	No	No	No	No	No	No
219	Muddy River Springs	No	No	No	No	No	No
	Curry, NM	No	No	No	No	No	No
	Hartley, TX[3,4]	No	No	No	No	No	No
	Other Affected Subunits or Counties						
4	Snake	Moderate	No	No	High	Low	No
5	Pine	High	Moderate	Low	Low	High	Low
9	Government Creek	High	No	No	Low	No	No
48	Beaver	High	High	High	No	High	High
49	Parowan	High	High	High	No	High	High
50	Milford[2]	High	No	No	No	No	No
51	Cedar	High	Moderate	Low	No	Low	Low
154	Newark[2]	High	No	No	No	Low	No
155	Little Smoky—N & S	High	No	No	No	Low	No
174	Jakes	High	No	No	No	High	No
175	Long	High	No	No	No	No	No
178	Butte	High	No	No	No	Low	No
180	Cave	High	No	No	No	High	No
183	Lake	High	No	High	No	High	High
184	Spring	High	No	No	No	High	No
185	Tippet	Moderate	No	No	No	No	No
190	Hamlin	High	High	High	No	High	High
196	Dry	Moderate	High	High	No	Low	No
201	Spring	High	High	High	No	No	High
202	Patterson	High	No	High	No	No	No
207	White River[2]	High	No	No	No	High	No
	Overall Alternative Impact		Moderate	Moderate	No	High	Low

[1]

No impact. (No sage grouse present for Abundance Index.)

Low impact.

Moderate impact. (Sage grouse range present for Abundance Index.)

High (significant) impact. (Sage grouse range and key habitat present for Abundance Index.)

[2]Conceptual location of Area Support Center (ASC) for Proposed Action and Alternatives 1-6.

[3]Conceptual location of Area Support Center (ASC) for Alternative 7.

[4]Conceptual location of Area Support Center (ASC) for Alternative 8.

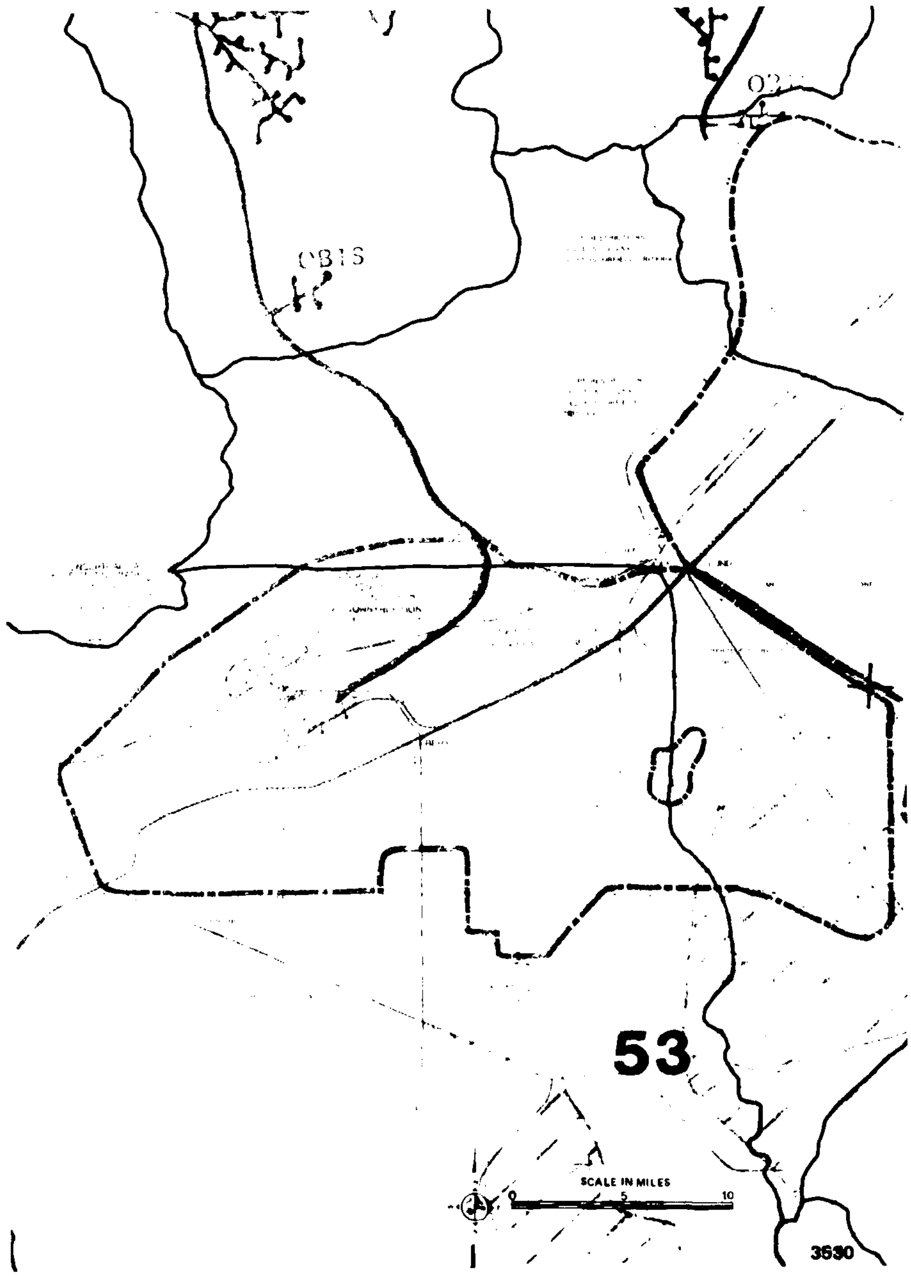


Figure 4.3.1.7-3. Sage grouse distribution in the Beryl OB vicinity.

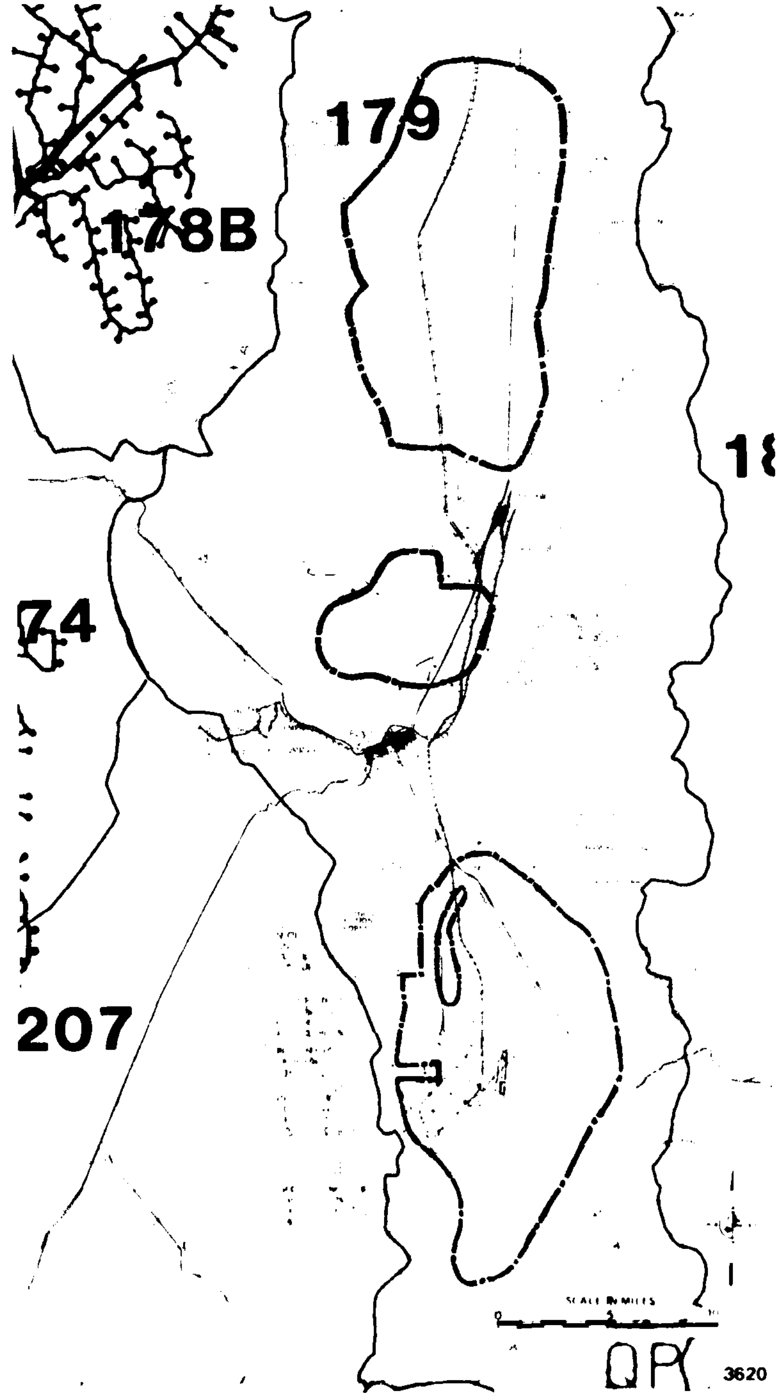


Figure 4.3.1.7-4. Distribution of sage grouse in the vicinity of the Ely operating base.

Six hydrographic subunits would be significantly impacted by the two OBs. Table 4.3.1.7-2 indicates that the overall impact to sage grouse under Alternative 4 is moderate.

ALTERNATIVE 5 (4.3.1.7.7)

Impacts in the DDA are the same as those for the Proposed Action. Impacts at the Ely OB are the same as those for Alternative 3.

Impacts at the Milford OB are the same as for the Proposed Action, except that use of the site for a first OB would result in more impacts to sage grouse because the population increases to about 17,000 people compared to 13,000 for a second OB. Table 4.3.1.7-3 shows that Alternative 5, like Alternative 3, has a significant indirect impact on sage grouse.

ALTERNATIVE 6 (4.3.1.7.8)

Impacts in the DDA and at the Coyote Spring OB are the same as those discussed for the Proposed Action. Impacts at the Milford OB are the same as for Alternative 5. Table 4.3.1.7-3 indicates a higher impact to sage grouse under this alterntive compared to the Proposed Action, because of the use of Milford for a first OB.

ALTERNATIVE 7 (4.3.1.7.9)

No sage grouse occur in the Texas/New Mexico DDA or at the Clovis and Dalhart OB sites, so Alternative 7 would not have an impact on this resource.

ALTERNATIVE 8 (4.3.1.7.10)

DDA Impacts

Under Alternative 8, 50 percent of the clusters proposed for deployment under the Proposed Action are eliminated from the Nevada/Utah area and placed in the Texas/New Mexico deployment area. Alternative 8 will have no effect on sage grouse in the Texas/New Mexico deployment area because this species is not present.

Split basing will have the same types of effects on sage grouse in Nevada/Utah as discussed for the Proposed Action. The impact of M-X and other future projects on sage grouse is expected to be comparable to that for full deployment, except that one Anaconda-Nevada Molybdenum mine is located outside the split basing area of Nevada and will not contribute to a cumulative impact.

Under split basing deployment, 14 hydrologic subunits having sage grouse habitat would be disturbed (Table 4.3.1.7-3), compared to 21 watersheds directly affected under full deployment. The criterion for a significant effect on sage grouse within a hydrologic subunit is loss of key habitat. Key habitat would be directly disturbed in only 3 watersheds: Lake Valley (#183) - 1 out of 1 known leks and 4 out of 7 known brood-use areas; Hamlin Valley (#196) - 2 out of 3 brood-use areas; and Garden Valley (#172) -2 out of 3 brood-use areas. The maximum percentage of sage grouse range directly removed within any impacted watershed would be approximately 1.5 percent. Under the Proposed Action, key habitat would be lost in 12 hydrologic subunits.

Table 4.3.1.7-3. Potential overall impact to sage grouse which could result from construction to operating bases for Alternatives 5-8.

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE INDEX[1]	ESTIMATED OVERALL IMPACT[1]			
NO.	NAME		ALT. 5 MILFORD ELY	ALT. 6 MILFORD COYOTE SPRING	ALT. 7 CLOVIS DALHART	ALT. 8 COYOTE SPRING CLOVIS
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert					
50	Milford[2,4]					
52	Lund District					
53	Beryl-Enterprise					
179	Steptoe					
210	Coyote Springs					
219	Muddy River Springs					
	Curry, NM					
	Hartley, TX[3]					
	Other Affected Subunits or Counties					
4	Snake					
5	Pine					
9	Government Creek					
48	Beaver					
49	Parowan					
50	Milford[2,4]					
51	Cedar					
154	Newark[2]					
155	Little Smoky N&S					
174	Jake					
175	Long					
178	Butte					
180	Cave					
183	Lake					
184	Spring					
185	Tippet					
196	Hamlin					
198	Dry					
201	Spring					
202	Patterson					
207	White River[2]					
	Overall Alternative Impact					

3832-1

[1] No impact. (No sage grouse present for Abundance Index.)
Low impact.
Moderate impact. (Sage grouse range present for Abundance Index.)
High (significant) impact. (Sage grouse range and key habitat present for Abundance Index.)

[2] Conceptual location of Area Support Center (ASC) for Proposed Action and Alternatives 1-6.

[3] Conceptual location of Area Support Center (ASC) for Alternative 7.

[4] Conceptual location of Area Support Center (ASC) for Alternative 8.

Lake Valley is the most heavily affected hydrologic subunit in terms of key habitat loss under split basing. The effect of key habitat loss and human activity would be greatest during the construction phase. The one known lek in Lake Valley would be eliminated by M-X. If this is the only lek in Lake Valley, that sage grouse population would be permanently lost. However, it is possible that additional leks exist, some of which may also be impacted by M-X. If other leks exist, recovery would occur over 3 to 5 years for key habitat behaviorally avoided by the birds but not destroyed. This assumes that animals avoiding project intersections with key habitat die or do not reproduce during their avoidance. Recovery may reach 70 to 90 percent of current abundance. A loss of 4 out of 7 known brood-use acres would hamper recovery and perhaps keep abundance down to the 70 to 80 percent of pre-project levels.

Short-term productivity would be expected to drop 20 to 40 percent because of direct and indirect key habitat loss, but long-term productivity may approach current levels (90 - 95 percent). The discussion of Proposed Action impacts provides details on effects, recovery, productivity, irretrievable resource commitments, and impact significance. Split basing has a much smaller negative effect than the Proposed Action on sage grouse.

OB Impacts

No sage grouse occur in the vicinity of the Coyote Spring and Clovis OBs; therefore, the OBs for Alternative 8 would have no impact on this resource.

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Bighorn Sheep

BIGHORN SHEEP

INTRODUCTION (4.3.1.8.1)

Bighorn sheep are a trophy big game species in Nevada and Utah for which hunter demand far exceeds the supply (1,289 applicants for 104 permits in 1978). The species also has a high aesthetic appeal. Bighorns once inhabited most of the mountain ranges in Nevada and several in southwestern Utah. Their current distribution within the study area is limited primarily to southern Nevada, where several migration routes between mountain ranges have been identified. Impact analysis for bighorn sheep was determined by combining species information (e.g., range, abundance, and habitat requirements) and project data. Direct effects would occur where the project intersects known range or migration routes, while indirect effects would occur where substantial increases in population occur in proximity to bighorn sheep habitat. Short-term impacts in the DDA were defined as significant if habitat was lost, if migration routes were crossed, or if more than 1,000 project-related people would be living within 25 mi of bighorn sheep habitat. Direct impacts resulting from the operating bases were assumed to be significant if any habitat would be lost or any migration routes would be crossed. Short and long-term indirect impacts in the vicinity of the OBs were determined using the abundance of bighorn sheep and an indirect effect index developed by a model that describes the distribution of people around the OBs. A distance of 35 mi from the OB was used as a limit on the area that could be affected.

PROPOSED ACTION (4.3.1.8.2)

DDA Impacts

Figure 4.3.1.8-1 shows the relationship of bighorn sheep range to the conceptual project configuration. Because of their limited distribution and preference for rugged terrain, bighorn sheep are not likely to be directly affected by M-X in the DDA. Short-term indirect effects, however, could result from recreational activities of project personnel and their dependents during construction of the DDA. Bighorn sheep are tolerant of some human activity within their habitat, but such activities at water sites during the dry summer months, when bighorn sheep are concentrated within about 2 mi (3 km) of permanent water sources, could have

detrimental effects on their populations. Studies of bighorn sheep and human use at a summer water site (Jorgensen, 1974) have shown that bighorn use of the site decreased approximately 50 percent on days when vehicle traffic was present. Thus, increased human activities at bighorn summer watering sites resulting from M-X induced population growth could adversely affect the bighorn sheep populations in southern Nevada. Although hunting is closely regulated, illegal harvest occurs and would obviously affect bighorn in abundance. Cumulative effects of M-X and other projects in the study area would not be expected to occur in the DDA.

Indirect effects to bighorn sheep in the DDA would be expected to occur only during construction when a large number of people would be present. Construction camps in Ralston, Dry Lake, Snake and Railroad valleys would be within 25 mi (40 km) of bighorn sheep habitat at Lone Mountain (146 sheep), in the Grant Range (100 sheep), in the Delamar Mountains (50 sheep), and in the Snake Range (Rocky Mountain bighorn transplant sites). Once construction is completed few project-related people would be present in the DDA, thus reducing the potential for long-term effects on bighorn to a very low level.

Short-term abundance of bighorn sheep could be reduced in the Grant Range, Delamar Mountains, Snake Range, and at Lone Mountain as a result of recreational activities and illegal harvest by construction personnel. The level of reduction cannot be reasonably estimated, and long-term effects are expected to be minimal in these areas. No irreversible or irretrievable commitments of bighorn sheep resources in the DDA are anticipated.

The effect of recreational activities and illegal harvest on bighorn sheep would be to reduce their numbers, which would then reduce other recreational opportunities, such as hunting and observation. Any decrease in population size for this valued species would be perceived as a significant impact by many people. Such impacts are predicted to occur over a short time and at only a few locations in the DDA. These effects could be avoided by implementing the mitigation measures described below.

The estimate of significant impact is a worst case prediction since much of the preferred habitat of bighorn sheep is often inaccessible to humans or in areas with no other attractive features, such as fishable streams or camping facilities. Table 4.3.1.8-1 summarizes the potential impact to bighorn sheep in the Nevada/Utah potential deployment area by hydrologic subunit. The effects are expected to be short term, and bighorn population recovery would require approximately 5 years based on the demographic characteristics of bighorn sheep in the study area.

Mitigation measures that could be employed to reduce indirect impacts to bighorn sheep include:

- Prohibition of possession of high power rifles by construction workers while stationed in construction camps, both on and off duty.
- Restriction of recreational use of bighorn watering sites during the summer months in areas under governmental jurisdiction.
- Strict enforcement of hunting laws by state authorities.

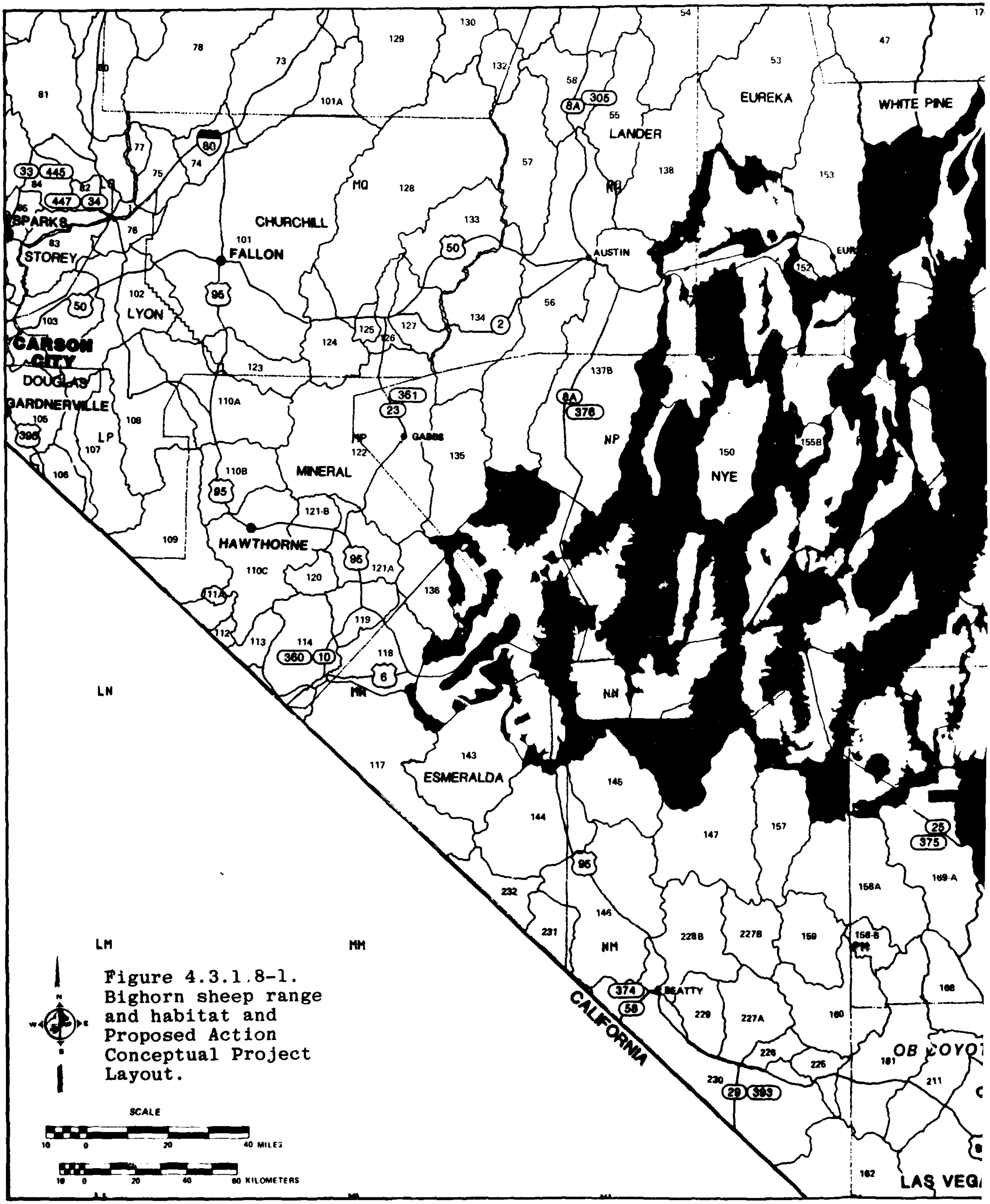

Figure 4.3.1.8-1. Bighorn sheep range and habitat and Proposed Action Conceptual Project Layout.

SCALE

10 0 20 40 MILES

10 0 20 40 60 KILOMETERS

AD-A104 358 AIR FORCE SYSTEMS COMMAND WASHINGTON DC F/G 8/6
DRAFT ENVIRONMENTAL IMPACT STATEMENT. MX DEPLOYMENT AREA SELECT--ETC(U)
DEC 80
UNCLASSIFIED AFSC-TR-81-58 NL

3 OF 3
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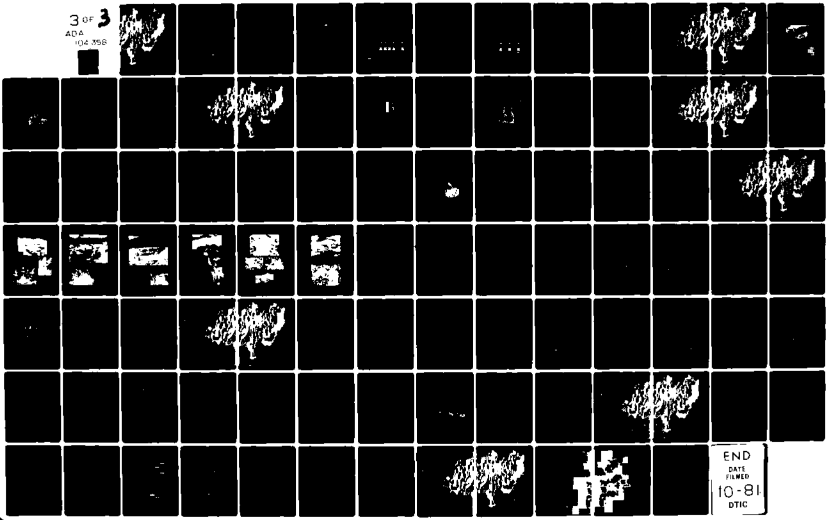

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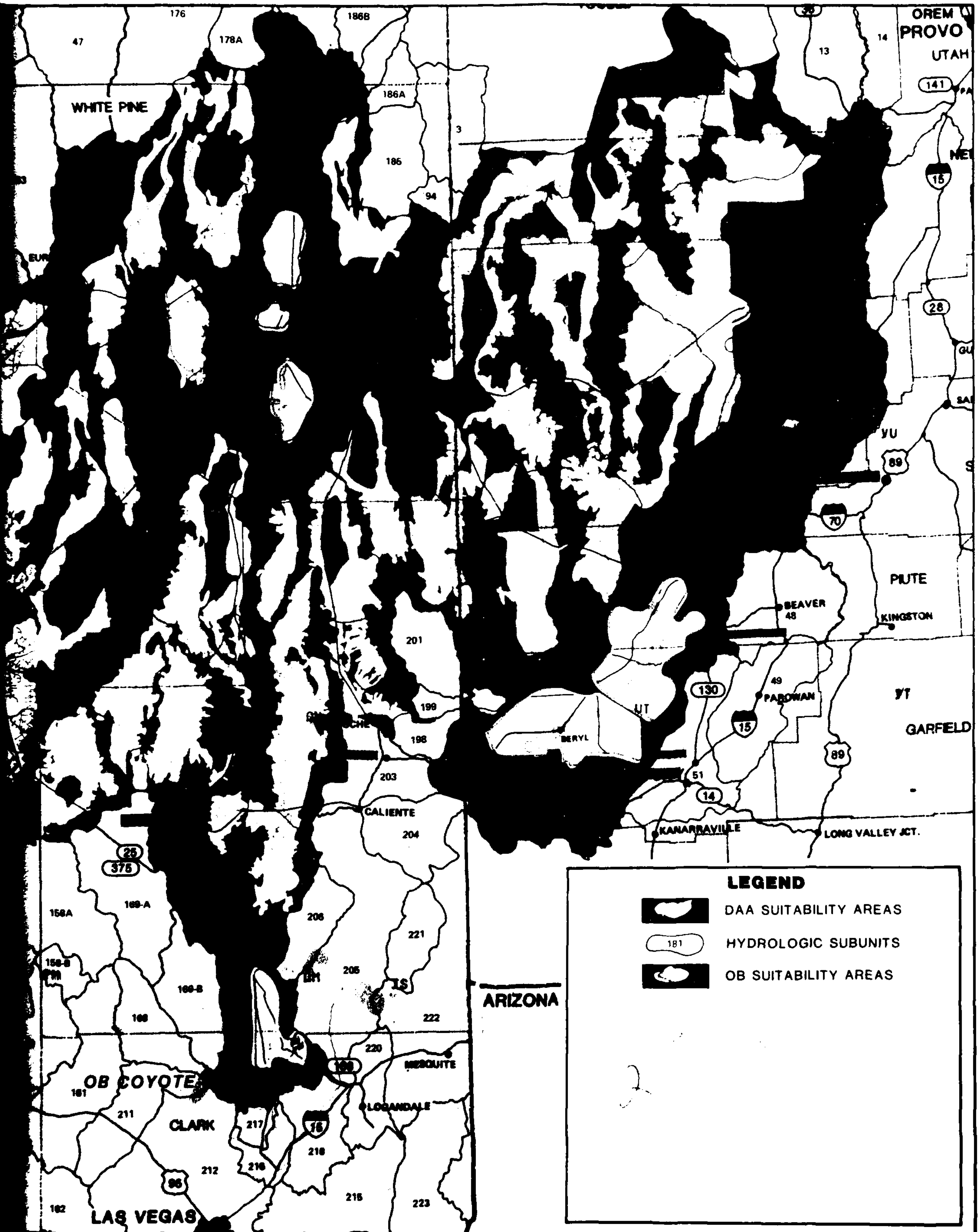

LEGEND
DAA SUITABILITY AREAS
HYDROLOGIC SUBUNITS
OB SUITABILITY AREAS
OREM
PROVO
UTAH
WHITE PINE
ARIZONA
BEAVER
PIUTE
KINGSTON
PAROWAN
GARFIELD
BERYL
CALIENTE
KANARRAVILLE
LONG VALLEY JCT.
MESQUITE
LOGANDALE
OB COYOTE
CLARK
LAS VEGAS

3222-D

Table 4.3.1.8-1. Potential impact to bighorn sheep in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	ABUNDANCE INDEX[1]	SHORT-TERM IMPACTS[2,3]	LONG-TERM IMPACTS[2,3]
	Subunits with M-X Clusters and DTN			
4	Snake	Moderate impact	High impact	No impact
5	Pine	No impact	No impact	No impact
6	White	No impact	No impact	No impact
7	Fish Springs	No impact	No impact	No impact
8	Dugway	No impact	No impact	No impact
9	Government Creek	No impact	No impact	No impact
46	Sevier Desert	No impact	No impact	No impact
46A	Sevier Desert-Dry Lake[4]	No impact	No impact	No impact
54	Wah Wah	No impact	No impact	No impact
137A	Big Smoky-Tonopah Flat	High impact	High impact	No impact
139	Kobeh	No impact	No impact	No impact
140A	Monitor—Northern	No impact	No impact	No impact
140B	Monitor—Southern	No impact	No impact	No impact
141	Ralston	No impact	No impact	No impact
142	Alkali Spring	No impact	No impact	No impact
148	Cactus Flat	No impact	No impact	No impact
149	Stone Cabin[4]	No impact	No impact	No impact
151	Antelope	No impact	No impact	No impact
154	Newark[4]	No impact	No impact	No impact
155A	Little Smoky—Northern	No impact	No impact	No impact
155C	Little Smoky—Southern	No impact	No impact	No impact
156	Hot Creek	No impact	No impact	No impact
170	Penoyer	No impact	No impact	No impact
171	Coal	No impact	No impact	No impact
172	Garden	Moderate impact	High impact	No impact
173A	Railroad—Southern	No impact	No impact	No impact
173B	Railroad—Northern	Moderate impact	High impact	No impact
174	Jakes	No impact	No impact	No impact
175	Long	No impact	No impact	No impact
178B	Butte—South	No impact	No impact	No impact
179	Steptoe	No impact	No impact	No impact
180	Cave	No impact	No impact	No impact
181	Dry Lake[4]	No impact	No impact	No impact
182	Delamar	Moderate impact	High impact	No impact
183	Lake	No impact	No impact	No impact
184	Spring	Moderate impact	High impact	No impact
196	Hamlin	No impact	No impact	No impact
202	Patterson	No impact	No impact	No impact
207	White River[4]	No impact	No impact	No impact
208	Pahroc	No impact	No impact	No impact
209	Pahranagat	No impact	Moderate impact	No impact
	Overall DDA Impact		High impact	No impact

3904-2

[1,2]

No impact. (No animals present for Abundance Index.)

Moderate impact. (Less than 150 present for Abundance Index.)

High (significant) impact. (More than 150 present for Abundance Index.)

[3]Potential for impact was determined using the abundance of bighorn sheep and presence of a construction camp within 25 mi (40 km) of bighorn habitat.

[4]Conceptual location of Area Support Centers (ASCs).

Coyote Spring Valley OB Impacts

The Coyote Spring OB suitability area overlaps bighorn sheep habitat in the Delamar Mountains, Meadow Valley Mountains, and Arrow Canyon Range (Figure 4.3.1.8-2). The road from Highway 93 to Moapa crosses a bighorn migration route between the Meadow Valley Mountains and the Arrow Canyon Range. Increased traffic on the road could be expected to increase the incidence of bighorn road kills, probably in proportion to the traffic volume. The conceptual location of the OB in the suitability area would not cause any loss of bighorn sheep habitat, but areas of overlap do exist within the suitability envelope.

Siting an OB in Coyote Spring Wash is expected to have few direct effects on bighorn sheep. Indirect effects, however, could occur since bighorns inhabit all of the surrounding mountain ranges. The highest abundance location for bighorn sheep in the state, the Sheep Range, is within 10 mi (16 km) of the proposed OB site, but road access is limited. An estimated 732 animals inhabit this range with another 277 in the adjacent Las Vegas Range. Road access is fairly good for the Delamar, Meadow Valley, and Arrow Canyon Mountains. Recreational activities of construction and operations personnel and their dependents in these mountains, particularly during summer, could reduce bighorn population levels by decreasing kid survival rates if lactating ewes cannot get adequate water. Present data are insufficient to make reasonable estimates of illegal harvest, but this is another potential source of impact.

The only other project planned to occur concurrently with M-X in this area is the Harry Allen power plant in Dry Lake Valley approximately 25 mi (40 km) south of the proposed operating base location. The peak number of people associated with this project would be 8,000 and would increase the potential for impact to bighorn sheep in the Las Vegas and Arrow Canyon ranges.

The indirect effects resulting from population growth in the Coyote Spring area are expected to peak during construction when the maximum number of people (approximately 28,000) would be present in the area, and then, decline in proportion to the number of permanent residents (16,000) during operations. Many of these people would live in Las Vegas which is about 40 mi (64 km) south of the base site and would seek recreation either in Las Vegas or at Lake Mead 35 to 40 mi (56 to 64 km) to the southeast or south. Some, however, would choose to recreate in the nearby mountains. Recreation and development pressure in bighorn sheep habitat as well as competition with domestic livestock are currently limiting expansion of bighorn populations. The large influx of people resulting from M-X deployment would increase these pressures and could change the current stable population trend to a decline.

Siting an OB in Coyote Spring Wash would be expected to reduce the numbers of bighorn sheep in areas used for recreation by project-related people. Whether this becomes a long-term effect will depend upon the number of people remaining after decommissioning of the project.

No irreversible or irretrievable commitment of resources is anticipated unless the base or support community are built in bighorn habitat.

Table 4.3.1.8-2 summarizes the potential indirect impacts to bighorn sheep in the vicinity of the operating bases. The potential for significant impact to bighorns is predicted in four of the seven hydrographic sub-units containing bighorns within

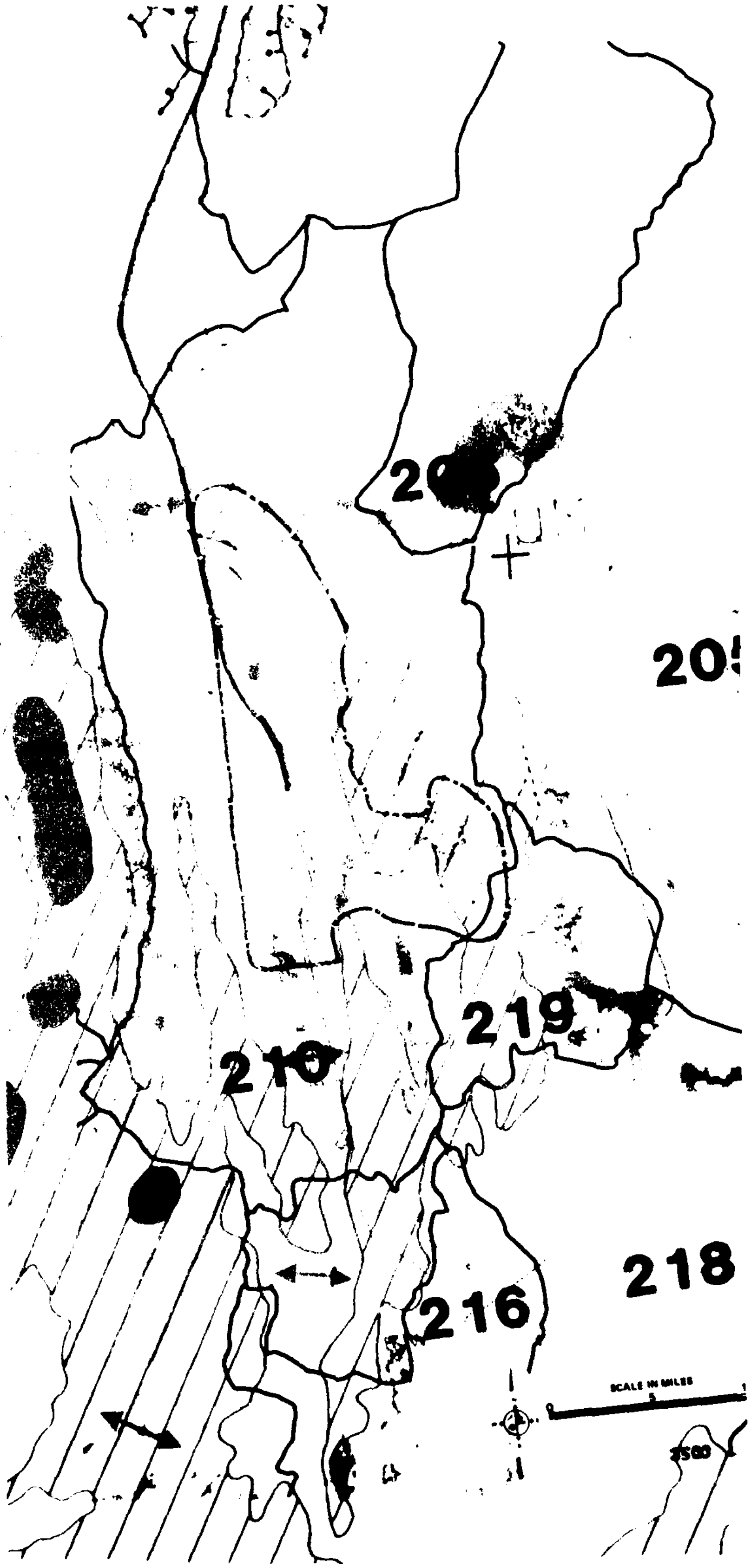


Figure 4.3.1.8-2. Relationship between bighorn sheep range and the Coyote Spring operating base location.

Table 4.3.1.8-2. Potential impact to bighorn sheep resulting from construction and operation of M-X operating bases for the Proposed Action and Alternative 1-4.

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE[1] INDEX	ESTIMATED OVERALL IMPACT[2,3]				
			PROPOSED ACTION	ALT. 1	ALT. 2	ALT. 3	ALT. 4
NO.	NAME		COYOTE SPRING/ MILFORD	COYOTE SPRING/ BERYL	COYOTE SPRING/ DELTA	BERYL/ ELY	BERYL/ COYOTE SPRING
	Subunits or Counties within OB Suitability Area						
46	*Sevier Desert*	No impact			No impact		
46A	Sevier Desert - Dry Lake[4]	No impact			No impact		
50	Milford[4]	No impact	No impact				
52	Lund District	No impact	No impact	No impact		No impact	No impact
53	Beryl-Enterprise	No impact		No impact		No impact	No impact
179	Steptoe	No impact				No impact	
210	Coyote Spring	High	High	High	High		High
219	Muddy River Springs	Moderate	Moderate	Moderate	Moderate		Moderate
	Curry, NM						
	Hartley, TX[4]						
	Other Affected Subunits or Counties						
169B	Tikaboo	High	High	High	High		High
206	Kane Spring	Moderate	Moderate	Moderate	Moderate		Moderate
216	Garnet	High	High	High	High		High
217	Hidden Valley	High	High	High	High		High
218	California Wash	Moderate	Moderate	Moderate	Moderate		Moderate
	Overall Alternative Impact		High	High	High	No impact	High

3905-2

[1,2]

No impact. (No animals present for Abundance Index.)

Moderate impact. (Less than 150 present for Abundance Index.)

High (significant) impact. (More than 150 present for Abundance Index.)

[1]Potential for impact was determined using the abundance of bighorn sheep and an indirect effect index developed by a model further described in ETA-30.

[4]Conceptual location of Area Support Centers (ASCs).

35 mi (56 km) of the OB. Potential for moderate impact is predicted for the other three subunits. Several mitigation measures could be implemented to reduce the potential impacts to bighorn sheep.

- o Develop water sites in areas not accessible for recreation
- o Restrict recreational use during summer of bighorn sheep water sites in areas under governmental jurisdiction.

Milford OB Impacts

Bighorn sheep do not inhabit any of the mountains near the Milford area, and no significant impacts are anticipated.

ALTERNATIVE 1 (4.3.1.8.3)

Impacts in the DDA and at the Coyote Spring OB are the same as those for the Proposed Action. No bighorn sheep inhabit the area near the proposed Beryl OB site. Some have been transplanted into Zion National Park but no significant effects resulting from M-X are expected.

ALTERNATIVE 2 (4.3.1.8.4)

Impacts in the DDA and at the Coyote Spring OB are the same as those for the Proposed Action. No bighorn sheep habitat is present near the Delta OB site, and consequently, no significant impacts are predicted.

ALTERNATIVE 3 (4.3.1.8.5)

Impacts in the DDA are the same as those for the Proposed Action. No bighorn sheep currently inhabit the area near the proposed Beryl OB site. Some sheep hae been transplantd to Zion National Park, but no significant impacts from M-X are expected. No bighorn sheep presently inhabit the mountains near the proposed Ely OB site.

ALTERNATIVE 4 (4.3.1.8.6)

Impacts in the DDA and at the Coyote Spring OB are the same as those for the Proposed Action. No bighorn sheep currently inhabit the area near the proposed Beryl OB site. Some sheep have been transplanted to Zion National Park, but no significant impacts from M-X are expected.

ALTERNATIVE 5 (4.3.1.8.7)

Impacts in the DDA are the same as those for the Proposed Action. Table 4.3.1.8-3 summarizes OB impacts for Alternatives 5 through 8. No bighorn sheep occur near the proposed Milford and Ely OB sites, so no impacts are predicted.

ALTERNATIVE 6 (4.3.1.8.8)

Impacts in the DDA and at the Coyote Spring OB are the same as those for the Proposed Action. Since bighorn sheep do not inhabit the mountains near the proposed Milford OB site, no impacts are predicted.

Table 4.3.1.8-3. Potential impact to bighorn sheep resulting from construction and operation of M-X operating bases for Alternatives 5-8.

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE INDEX[1]	ESTIMATED OVERALL IMPACT[2,3]			
			ALT. 5	ALT. 6	ALT. 7	ALT. 8
NO.	NAME		MILFORD/ ELY	MILFORD/ COYOTE SPRING	CLOVIS/ DALHART	COYOTE SPRING/ CLOVIS
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert	□				
46A	Sevier Desert & Dry Lake[4]	□				
50	Milford[4]	□	□	□		
52	Lund District	□	□	□		
53	Beryl-Enterprise	□				
179	Steptoe	□	□			
210	Coyote Spring	■		■		■
219	Muddy River Springs	▥		▥		▥
	Curry, NM				□	□
	Hartley, TX[4]				□	
	Other Affected Subunits or Counties					
169B	Tikaboo	■		■		■
206	Kane Spring	▥		▥		▥
216	Garnet	■		■		■
217	Hidden Valley	■		■		■
218	California-Wash	▥		▥		▥
	Overall Alternative Impact		□	■	□	■

3905-2

[1,2]

□ No impact. (No animals present for Abundance Index.)

▥ Moderate impact. (Less than 150 present for Abundance Index.)

■ High (significant) impact. (More than 150 present for Abundance Index.)

[3]Potential for impact was determined using the abundance of bighorn sheep and an indirect effect index developed by a model further described in ETA-30.

[4]Conceptual location of Area Support Centers (ASCs).

ALTERNATIVE 7 (4.3.1.8.9)

Bighorn sheep are not present in the Texas/New Mexico study area so project deployment would have no impacts on this species.

ALTERNATIVE 8 (4.3.1.8.10)

Figure 4.3.1.8-3 shows the project configuration in relationship to bighorn sheep range in Nevada and Utah. Potential impacts to bighorn sheep resulting from DDA construction would be the same as those described for the Proposed Action, except that significant impacts would be expected for bighorns only in the southern portion of the Grant Range and in the Delamar Mountains (Table 4.3.1.8-4). Although project elements would occur in Snake Valley, the construction camp would not be within 25 mi (40 km) of the Snake Range. Impacts at the Coyote Spring OB are the same as those for the Proposed Action. No bighorn sheep occur in the Texas/New Mexico study area.

Table 4.3.1.8-4. Potential impact to bighorn sheep in Nevada/Utah DDA for Alternative 8.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	ABUNDANCE INDEX[1]	SHORT-TERM IMPACTS[2,3]	LONG-TERM IMPACTS[2,3]
	Subunits or Counties with M-X Clusters and DTN			
4	Snake	Moderate	High	No impact
5	Pine	No impact	No impact	No impact
6	White	No impact	No impact	No impact
7	Fish Springs	No impact	No impact	No impact
46	Sevier Desert	No impact	No impact	No impact
46A	Sevier Desert-Dry Lake[4]	No impact	No impact	No impact
54	Wah Wah	No impact	No impact	No impact
155C	Little Smoky - Southern	No impact	No impact	No impact
156	Hot Creek	No impact	No impact	No impact
170	Penoyer	No impact	No impact	No impact
171	Coal	No impact	No impact	No impact
172	Garden	Moderate	High	No impact
173A	Railroad - Southern	No impact	No impact	No impact
173B	Railroad - Northern	Moderate	High	No impact
180	Cave	No impact	No impact	No impact
181	Dry Lake[4]	No impact	No impact	No impact
182	Delamar	Moderate	High	No impact
183	Lake	No impact	No impact	No impact
184	Spring	Moderate	High	No impact
196	Hamlin	No impact	No impact	No impact
202	Patterson	No impact	No impact	No impact
207	White River	No impact	No impact	No impact
	Bailey, TX	No impact	No impact	No impact
	Cochran, TX	No impact	No impact	No impact
	Dallam, TX	No impact	No impact	No impact
	Deaf Smith, TX	No impact	No impact	No impact
	Hartley, TX[4]	No impact	No impact	No impact
	Hockley, TX	No impact	No impact	No impact
	Lamb, TX	No impact	No impact	No impact
	Oldham, TX	No impact	No impact	No impact
	Parmer, TX	No impact	No impact	No impact
	Chaves, NM	No impact	No impact	No impact
	Curry, NM	No impact	No impact	No impact
	DeBaca, NM	No impact	No impact	No impact
	Guadalupe, NM	No impact	No impact	No impact
	Harding, NM	No impact	No impact	No impact
	Lea, NM	No impact	No impact	No impact
	Quay, NM	No impact	No impact	No impact
	Roosevelt, NM[4]	No impact	No impact	No impact
	Union, NM	No impact	No impact	No impact
	Overall DDA Impact		High	No impact

3906-2

[1,2]

No impact (No animals present for Abundance Index).

Moderate impact. (Less than 150 present for Abundance Index).

High (significant) impact. (More than 150 present for Abundance Index.)

[3]Potential for impact was determined using the abundance of bighorn sheep and presence of a construction camp within 25 mi (40 km) of bighorn habitat.

[4]Conceptual location of Area Support Centers (ASCs).

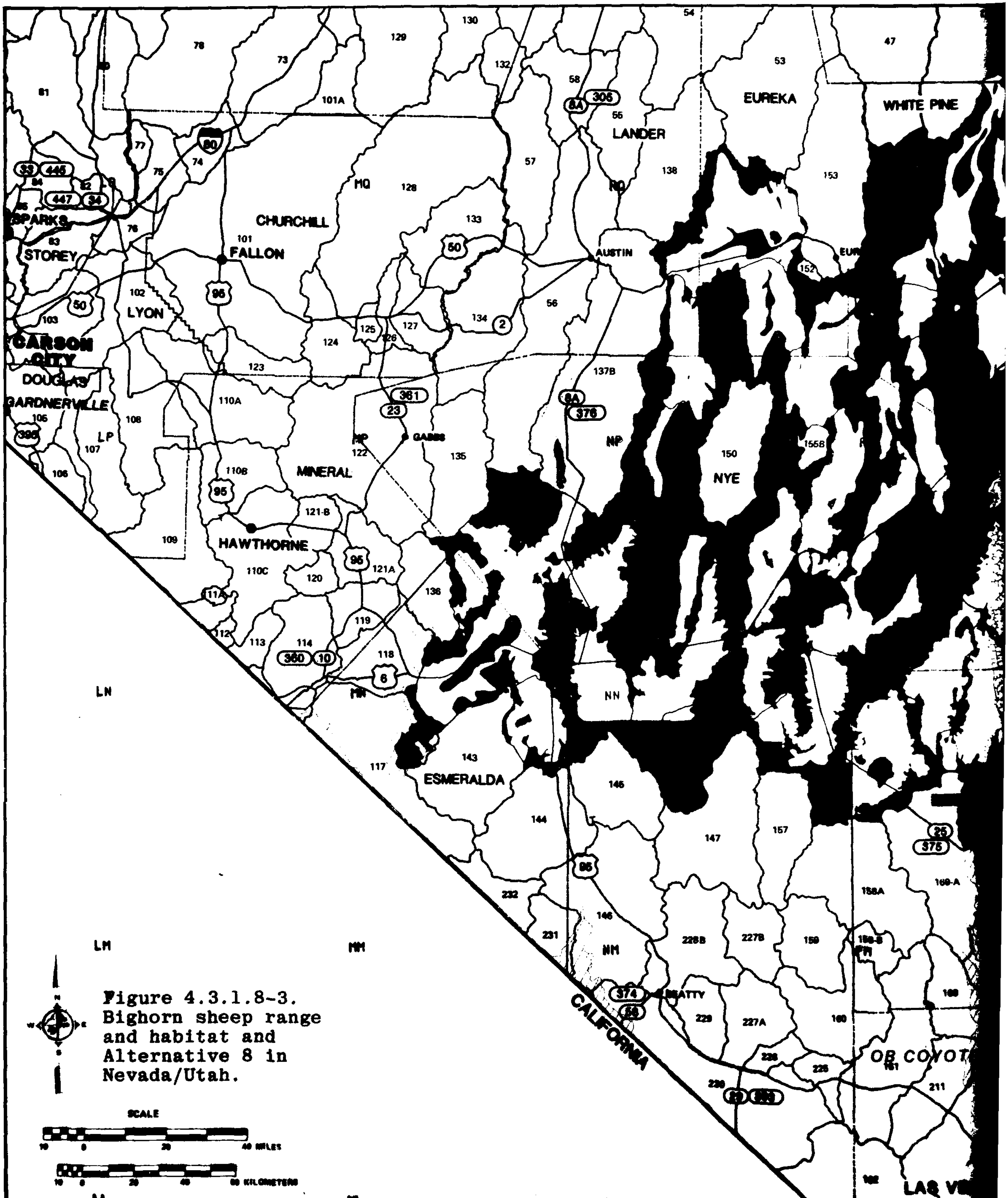
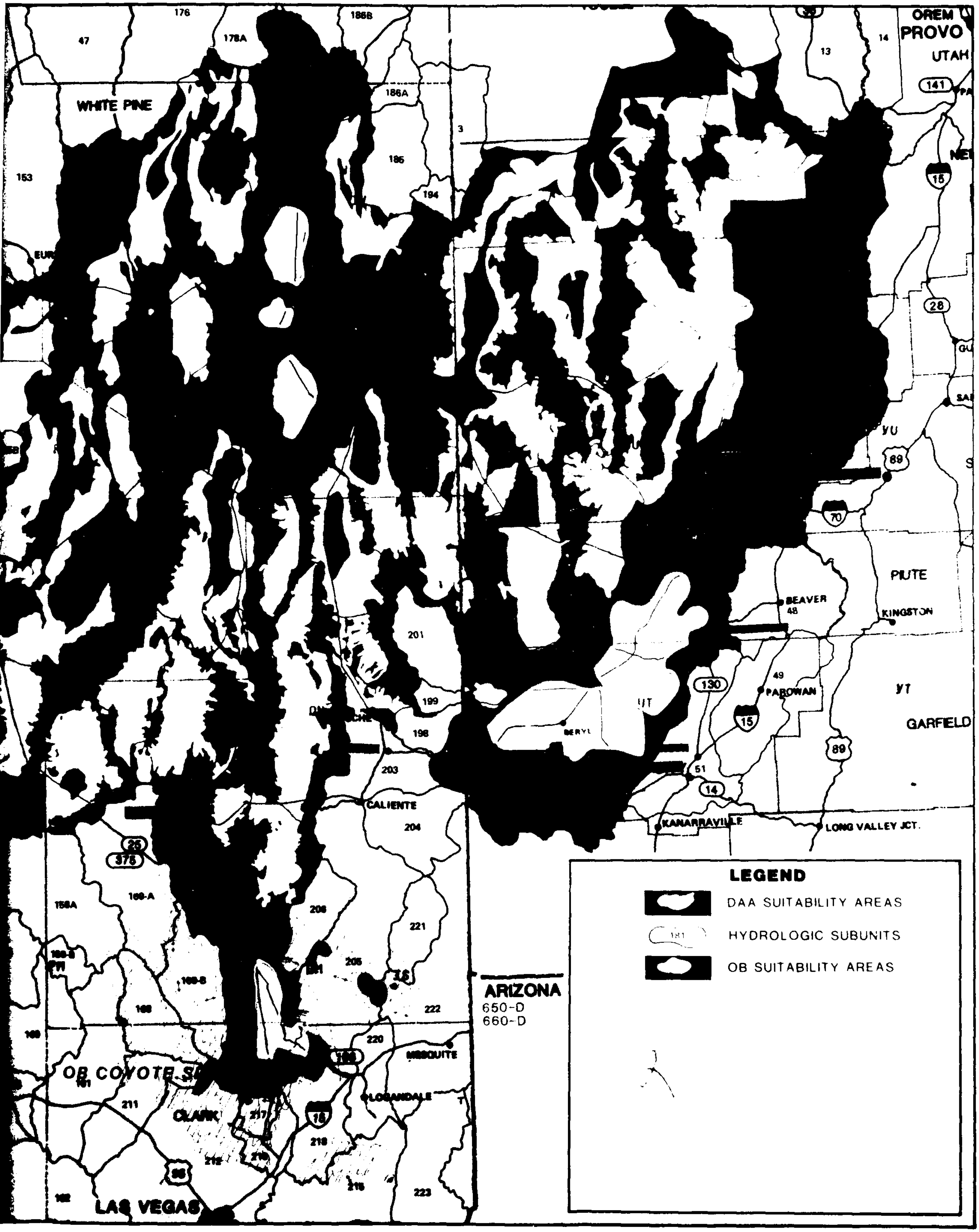


Figure 4.3.1.8-3. Bighorn sheep range and habitat and Alternative 8 in Nevada/Utah.



LEGEND
DAA SUITABILITY AREAS
HYDROLOGIC SUBUNITS
OB SUITABILITY AREAS
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UTAH
PIUTE
BEAVER
KINGSTON
PAROWAN
GARFIELD
BERYL
CALIENTE
KANARRAVILLE
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MESQUITE
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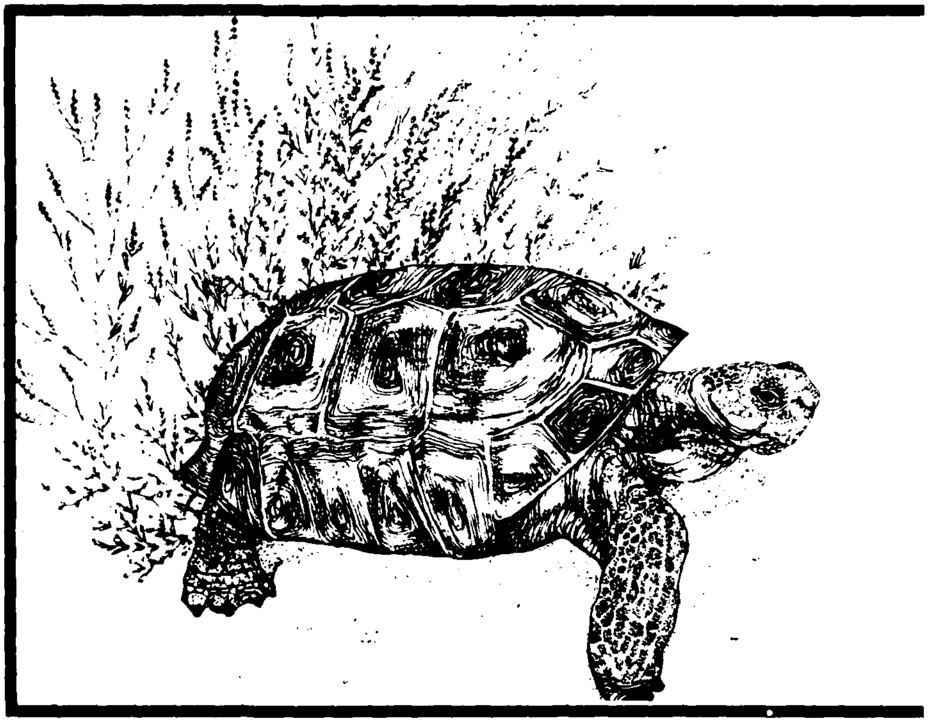
Protected Species

Desert Tortoise



DESERT TORTOISE

INTRODUCTION (4.3.1.9.1.1)

The desert tortoise is a large, herbivorous reptile that inhabits the Mojave and Sonoran desert habitat in southern Nevada, southwestern Utah, southeastern California, western Arizona, and south into Mexico. There are indications that the desert tortoise is declining throughout its range and that most of this decline can be attributed to human disturbances. These declines have led to the protection of the desert tortoise in the four states in which it occurs and to the federal designation of threatened status in the Beaver Dam Slope of southwestern Utah. In addition, throughout its range the desert tortoise is now under review for federal protection (FR 45 (163)). That human activity constitutes the major threat to the desert tortoise may be seen in the following quotation.

> The chief threats to the tortoise include habitat destruction through development for residential and agricultural use, overgrazing (Berry, 1978), geothermal development, taking as pets (now largely controlled by individual states), malicious killing, from being run over on roads, and for competition with grazing or feral animals. Natural predation may or may not be a significant factor in the decline of this species, depending on age class involved (FR 45;163).

PROPOSED ACTION (4.3.1.9.1.2)

DDA Impacts

Figure 4.3.1.9-1 overlays the M-X DDA in Nevada and Utah and the desert tortoise distribution. No adverse impacts are expected to occur to desert tortoises from the construction of clusters and DTN in the valleys of Nevada and Utah because these structures are not located in desert tortoise habitat.

Coyote Spring Valley OB Impacts

Figure 4.3.1.9-2 overlays the conceptual Coyote Spring operating base and suitability envelope and desert tortoise distribution. A base in Coyote Spring Wash will negatively impact desert tortoises by direct habitat destruction and by indirect human actions. This base will directly eliminate approximately 7,000 to 7,500 acres of desert tortoise habitat, which has an estimated density of 117 tortoises per

square mile (Enriquez, 1977). More recent estimates by BLM indicate that 90 percent of this valley has medium to high tortoise densities. The operating base suitability envelope covers a large portion of medium density tortoise habitat from north to south and a large area of high tortoise density in the eastern part of this envelope. The base community is presently located in a high tortoise density area and the air field and base structures are in a high to medium tortoise density area. The railroad spur running from the Union Pacific Railroad to the east up Coyote Spring from the south would run through high and very high tortoise densi areas. Given that the disturbed roadbed is approximately 30 ft wide and the spu vill be about 25 mi long, approximately 40 more acres would be permanently lost to tortoises; more will be disturbed to build the line, and potential expansion of Route 93 could remove an additional 300 acres.

In addition to direct habitat destruction due to the construction of base facilities and the rail line, approximately 16,000 people will inhabit this area. Collection of tortoises for pets has depleted tortoise populations near cities. Collection can significantly change age class ratios leading to lower reproduction in a population (Berry, 1976). An increase in use of secondary roads is also expected due to this population influx, which would also result in increased tortoise collecting (Luckenbach, 1975 cited in Steven, 1976). Besides the detrimental effect of people collecting tortoises, new roads and increased traffic on existing roads (particularly to and from Las Vegas) will result in additional tortoise deaths. Nicholson (1978) found that roads have a measurable detrimental effect on tortoise populations up to one kilometer.

Besides the actual habitat lost due to the construction of facilities, habitat destruction due to ORV activity can be severe. Near Barstow, California, estimated tortoise biomass was 3.4 kg/ha in non ORV-use areas versus 0.5 kg/ha. in the ORV-use area (Bury, 1978). Bury (1978) found that ORV's collapse burrows, destroys vegetation, and cause indirect mortality of tortoises, besides direct collisions. Heavy use around the base at Coyote Spring would probably be concentrated within a 3 mi radius (Rajala., 1980) and diminish with increasing distance. These impacts will be long-term for at least the life of the project. Long-term productivity would continue to decline and given the large number of people introduced to the area the possibility exists that densities of tortoises in this watershed could drop below the point where they can sustain their viability.

Due to its rare and protected status, any negative impacts to the desert tortoise are significant. If an operating base is located in Coyote Spring, most of these impact are unavoidable. The habitat lost to base construction and a new rail line would not be recovered. It may be possible to relocate some portion of the tortoise population, but without almost total cessation of cattle and sheep grazing and ORV activity in nearby areas, the remaining habitat may not be able to support these displaced tortoises. Indirect impacts may be reduced if off-road vehicle activity could be strictly prohibited. Also collecting of tortoises, which is prohibited by state law, should be strictly monitored as should harassment. Table 4.3.1.9-1 compares the effects to desert tortoises by the Coyote Spring and Milford OB. Only the Coyote Spring OB will cause significant negative impacts to desert tortoises. This would be true for any alternative which includes the Coyote Spring OB.

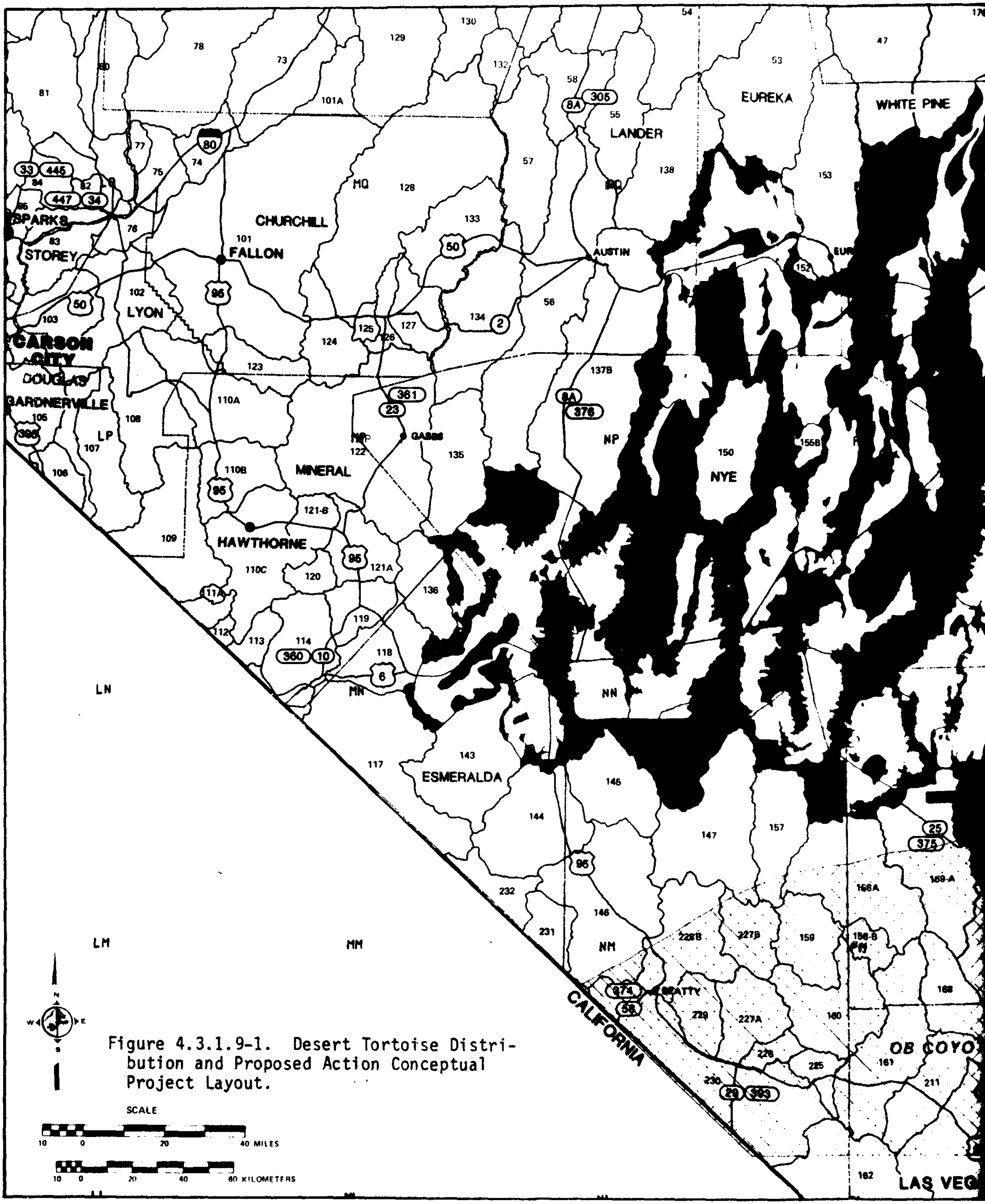
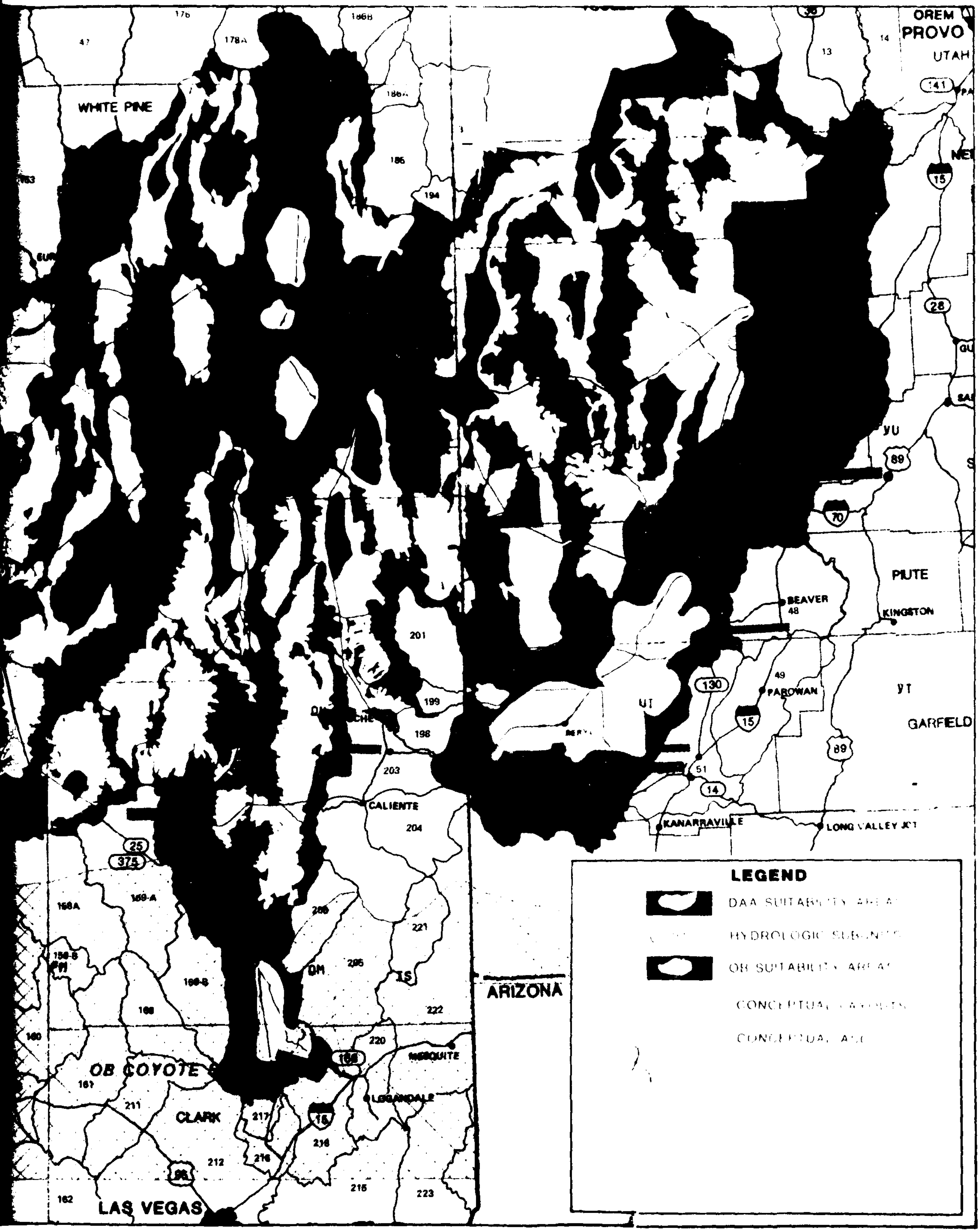


Figure 4.3.1.9-1. Desert Tortoise Distribution and Proposed Action Conceptual Project Layout.



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KANARRAVILLE
LONG VALLEY JCT
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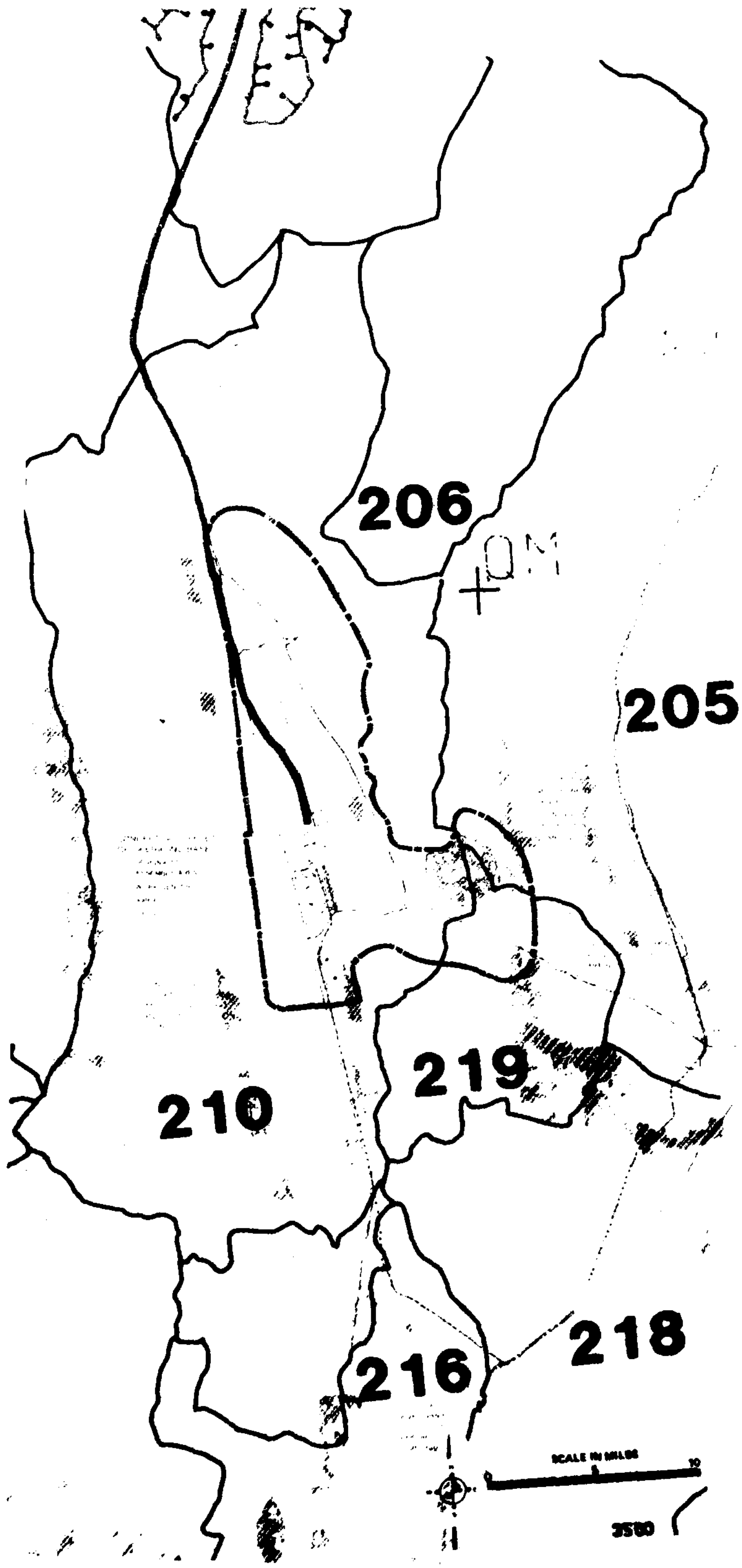

Figure 4.3.1.9-2. Intersection of the desert tortoise distribution and the Coyote Spring OB and vicinity.

Table 4.3.1.9-1. Potential impact to desert tortoises in Nevada and Utah within 70 mi of the proposed operating base at Coyote Spring.[1]

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	ABUNDANCE INDEX[2]	POTENTIAL INDIRECT IMPACT[3]
	Subunits Containing Base Suitability Area		
210	Coyote Spring		
219	Muddy River		
	Other Affected Subunits		
161	Indian Spring		
169B	Tikaboo—South		
205	Meadow Valley Wash		
206	Kane Spring		
209	Pahranagat Valley		
211	Three Lake		
212	Las Vegas		
215	Black Mountains		
216	Garnet		
217	Hidden Valley—North		
218	California Wash		
219	Muddy River		
220	Lower Moapa		
221	Tule Desert		
222	Virgin River		
223	Gold Butte		
	Overall Impact[4]		

3852-2

[1]NOTE: Desert tortoises would not be impacted in any other OB location. Also, construction of a DDA in Nevada/Utah or Texas/New Mexico would not impact the desert tortoise.

[2,3]

No impact. (No abundance.)

Low impact. (Low abundance.)

Moderate impact. (Moderate abundance.)

High impact. (High abundance.)

[3]Significance of impact was estimated for each hydrologic subunit by comparing the abundance index, indirect effect index (see ETR-30), and road access from the OB site. The nearness of a hydrologic subunit to Las Vegas was also considered, because recreational activities from Las Vegas may already be heavily impacting the desert tortoise. The presence of an OB at Coyote Spring Valley would not significantly add to the impacts from Las Vegas in certain subunits.

[4]The overall impact was judged significant because approximately 45 percent of the affected hydrologic subunits would be significantly impacted, and the desert tortoise is protected by Nevada and Utah state law as a threatened species and is under review for Federal protection under the Endangered Species Act.

Milford OB Impacts

No tortoises occur near Milford and no adverse impacts are expected.

Desert tortoises do not occur within the area of any other OB. In Alternatives 4 and 6 the Coyote Spring Wash OB is a second base. The impacts to desert tortoises would be similar to those alternatives where Coyote Spring OB is a first base but to a slightly smaller degree. Instead of 7,500 acres of habitat disturbed, approximately 4,500 would be used for a second base. Also instead of a long-term population of about 16,000 people, a second base at Coyote Spring Wash would have about 12,000. These reductions are not expected to change the overall effects to tortoises appreciably and use of the Coyote Spring Wash OB as a second OB would still cause significant impacts.

ALTERNATIVE 1 (4.3.1.9.1.3)

Impacts would be the same as for the Proposed Action.

ALTERNATIVE 2 (4.3.1.9.1.4)

Impacts would be the same as for the Proposed Action.

ALTERNATIVE 3 (4.3.1.9.1.5)

No impacts expected.

ALTERNATIVE 4 (4.3.1.9.1.6)

Impacts would be similar to those for the Proposed Action but reduced somewhat. This occurs because the second base would be smaller (about 4,500 acres versus 7,500 acres) and operating population would be less. These reductions do not significantly reduce the level of the impacts below that for the Proposed Action.

ALTERNATIVE 5 (4.3.1.9.1.7)

No impacts expected.

ALTERNATIVE 6 (4.3.1.9.1.8)

Impacts would be the same as for Alternative 4.

ALTERNATIVE 7 (4.3.1.9.1.9)

No impacts expected.

ALTERNATIVE 8 (4.3.1.9.1.10)

Impacts would be the same as for the Proposed Action.

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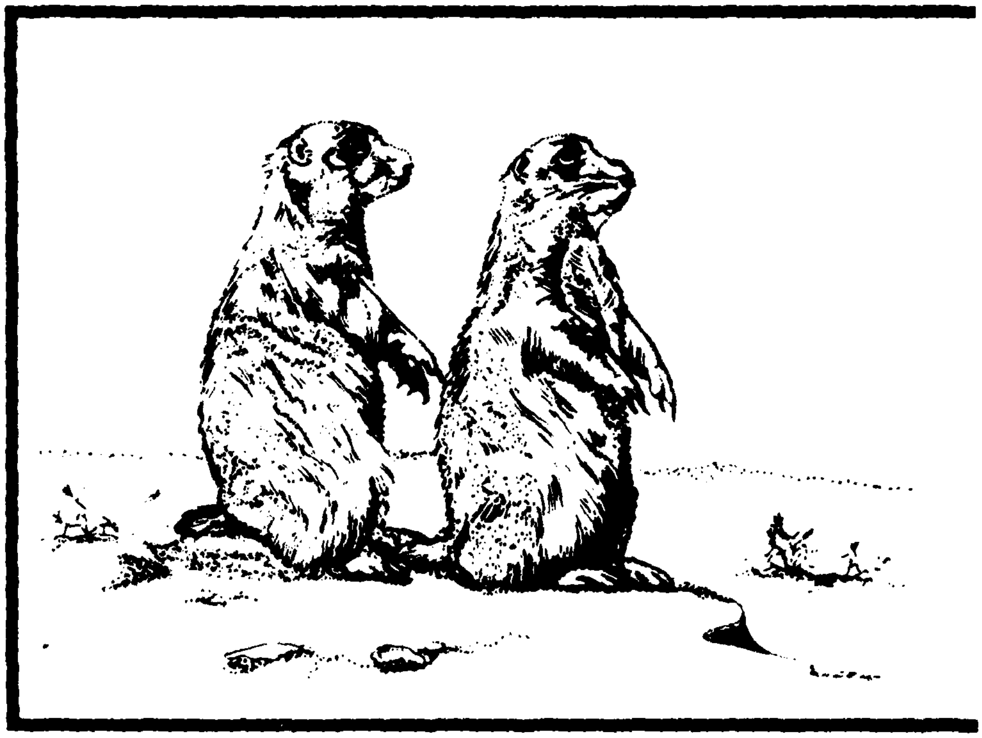
Utah Prairie Dog



UTAH PRAIRIE DOG

INTRODUCTION (4.3.1.9.2.1)

The Utah prairie dog (Cynomys parvidens) is a medium-sized colonial rodent that lives in large burrow complexes called towns. This species inhabits low, generally level, grassy areas and is dependent upon succulent forbs and grasses for food. The range of this species is the most restricted of all prairie dogs in the United States; it is currently found only in southern Utah, an area about half the size of its former range (Collier and Spillett 1975). This range reduction resulted from a change in climate, causing a drying trend, loss of habitat to agriculture and urbanization, and poisoning of prairie dogs by ranchers and farmers (Collier and Spillett, 1975). Because of its highly constricted range the Utah prairie dog was federally listed (June, 1973) as an endangered species.

PROPOSED ACTION (4.3.1.9.2.2)

DDA Impacts

Figure 4.3.1.9-3 overlays the M-X DDA in Nevada/Utah and the Utah prairie dog distribution. The Utah prairie dog would not be directly affected by the Proposed Action. No habitat would be lost because of construction activities. The only effects anticipated from DDA construction and operation are indirect effects from human activity in Pine Valley, Utah, the only valley within the deployment area supporting this species. These are discussed in greater detail under Alternative 3 because the largest human concentration as well as the greatest potential for direct impacts occurs with that alternative. Human activity would be greatest during the construction phase of M-X with an estimated population increase of 2,200. Most of these people will be located in a construction camp in central Pine Valley, 15 to 20 mi north of the prairie dog colonies. A dirt road currently exists down the middle of Pine Valley and would provide access to the prairie dog towns. Indirect effects from human activity, such as shooting, camping, and ORV use, would have some impact upon Utah prairie dogs. Shooting could eliminate small concentrations of prairie dogs but does not greatly influence large populations. Most shooting would likely occur close to the dirt road, perhaps up to one mile away. Camping is not likely to influence prairie dogs in that their habitat holds no

attractions. ORV activity has the highest potential to significantly impact Utah prairie dog habitat through loss of vegetation, soil disturbance and noise. ORV activity is expected to be moderate to low in southern Pine Valley because of the distance from the construction camp (15 to 20 mi). Most ORV activity is expected within 5 to 10 mi of camp. Indirect effects upon the Utah prairie dog would cause a slight reduction in their population, perhaps 1 percent or less, and most effects would likely occur within one mile of the central dirt road.

Short-term productivity would decrease slightly, if at all, and long-term productivity should recover to current levels once the construction camp is removed assuming present climatic conditions prevail.

The Proposed Action should not produce any irretrievable commitment of resources. Although indirect effects are not expected to jeopardize populations, the Utah prairie dog is a federally listed endangered species, and because of this any negative impacts must be considered significant. The indirect effects are avoidable by restricting human activities around the construction camp.

Most of the indirect effects can be mitigated by controlling human activity. Prohibition of firearms in camp and restriction of camping and ORV activity could reduce the effects to insignificance.

Coyote Spring Valley OB Impacts

No direct impacts and no significant indirect impacts on Utah prairie dogs from an OB at Coyote Spring Valley are anticipated.

Milford OB Impacts

A second OB at Milford (Figure 4.3.1.9-4) could have a peak of 17,700 people during construction, and a long-term population of 13,100. No direct impacts are anticipated from construction of the OB, however, indirect effects could result from human activity in Parowan Valley. Campgrounds in the mountains to the east of this valley, and other recreation areas east of Milford, would draw people through Parowan Valley and this traffic could possibly disrupt prairie dog habitat. Camping and ORV activity is not expected to be significant in this valley, as most of the prairie dog habitat is on private lands and access is likely restricted. Short-term and long-term effects would not be significantly different. Indirect effects upon the Utah prairie dog may cause a slight reduction in their population, probably less than one percent, in Parowan Valley. Reductions would likely occur in towns within one mile from a major roadway.

Short- and long-term productivity would decrease only slightly, if at all, and the base should not produce any irretrievable commitment of resources. An OB site at Milford has the potential to reduce productivity slightly in Parowan Valley. However, because the Utah prairie dog is a federally listed endangered species, the impact potential is considered moderate.

Table 4.3.1.9-2 indicates occurrence and significant impacts upon the Utah prairie dog. The predicted affect is small, perhaps unmeasureable, and would not be likely to jeopardize the species' existence. Even this effect could probably be mitigated through a variety of means.

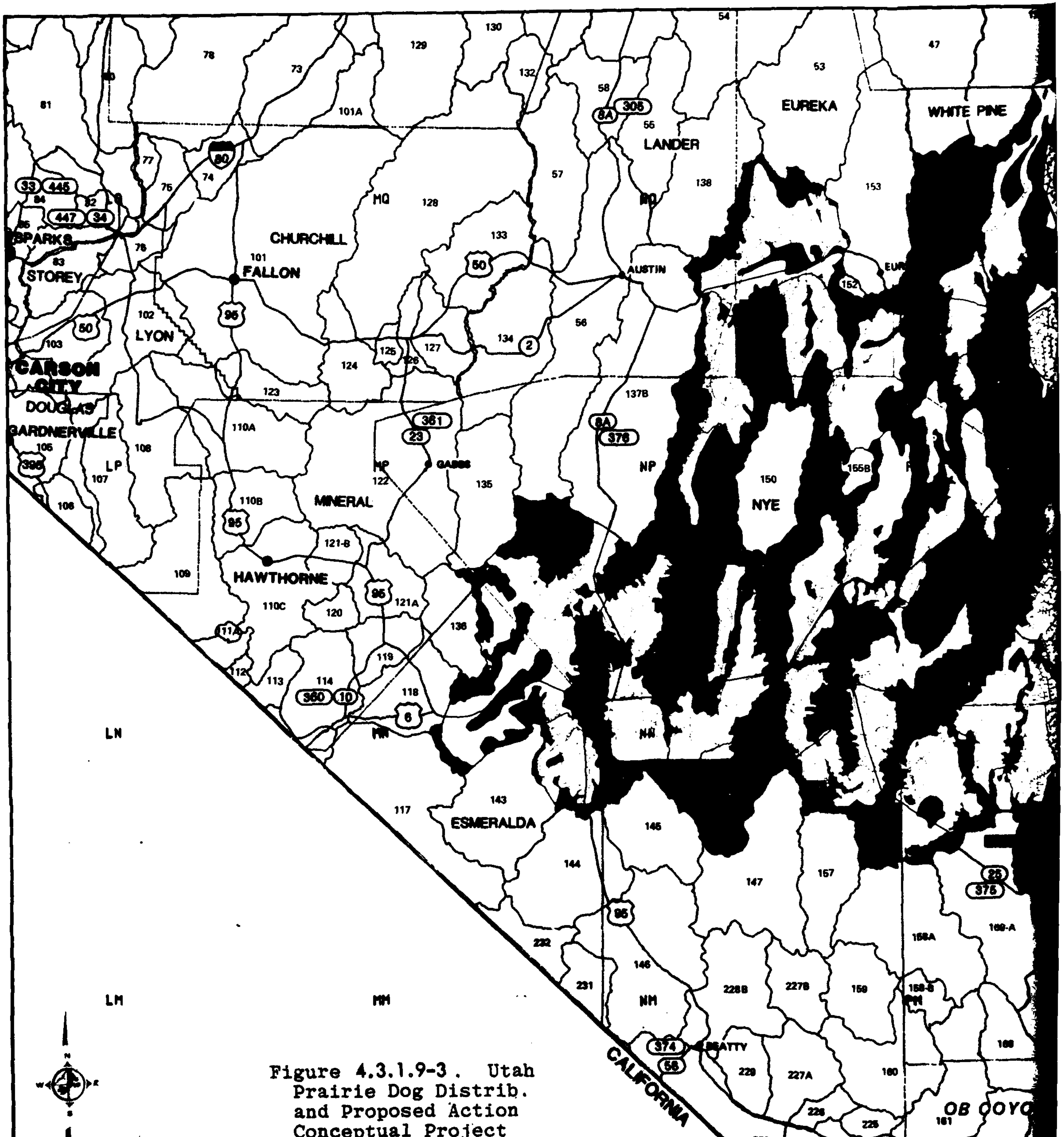
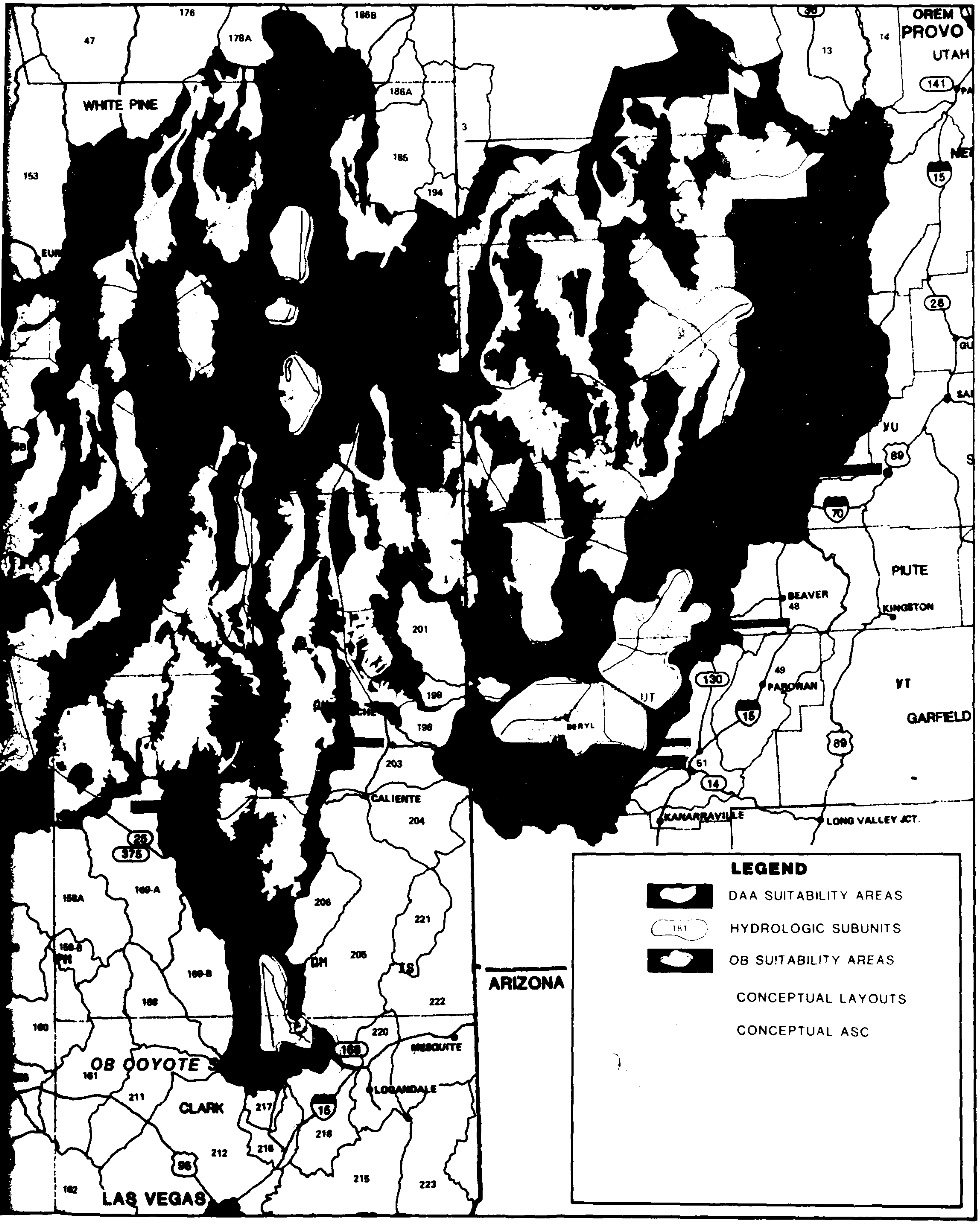


Figure 4.3.1.9-3. Utah Prairie Dog Distrib. and Proposed Action Conceptual Project Layout.



OREM
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OB SUITABILITY AREAS
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ARIZONA
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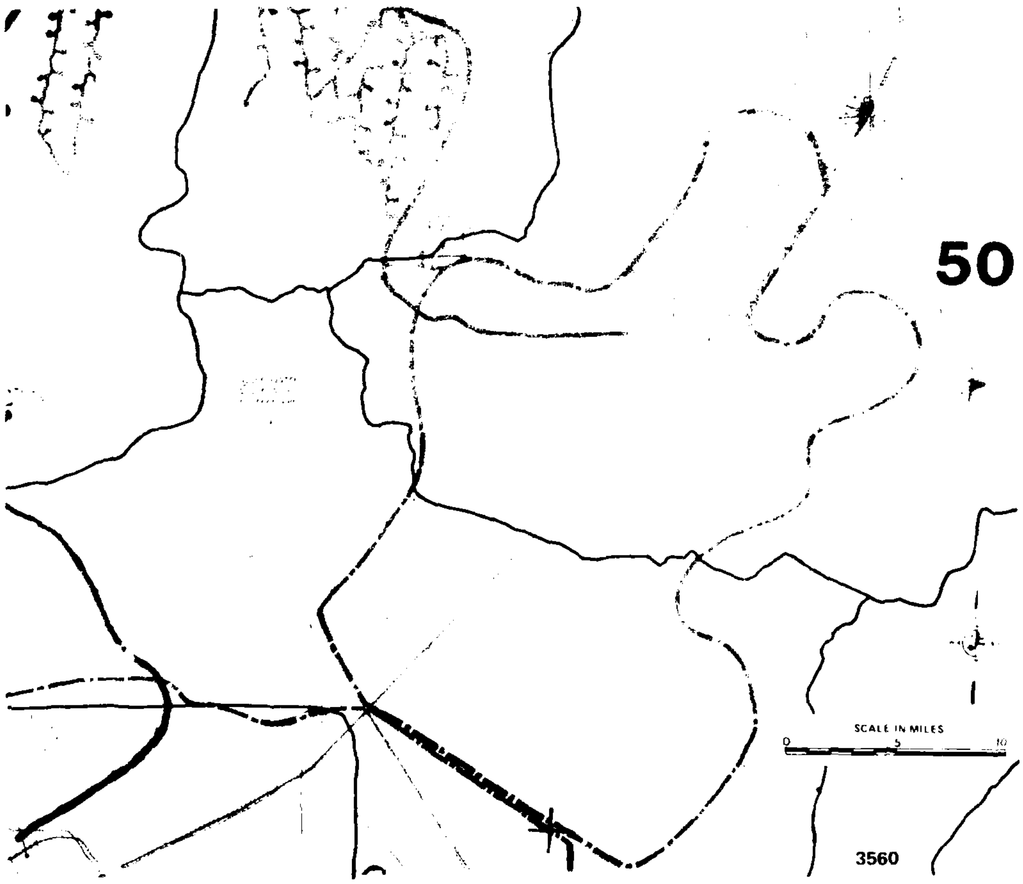


Figure 4.3.1.9-4. Distribution of Utah prairie dog in the vicinity of the Milford OB.

Table 4.3.1.9-2. Potential impact to the Utah prairie dog around operating bases (OBs) for the Proposed Action and Alternatives 1-8 (page 1 of 2).

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE INDEX[1]	SHORT- AND LONG-TERM IMPACT[1]				
			PROPOSED ACTION	ALT. 1	ALT. 2	ALT. 3	ALT. 4
NO.	NAME		COYOTE SPRING/ MILFORD	COYOTE SPRING/ BERYL	COYOTE SPRING/ DELTA	BERYL/ ELY	BERYL/ COYOTE SPRING
	Subunits or Counties within OB Suitability Area						
46	Sevier Desert	No impact			No impact		
46A	Sevier Desert & Dry Lake[2]	No impact			No impact		
50	Milford[2]	No impact	No impact				
52	Lund District	No impact	No impact	No impact		No impact	No impact
53	Beryl-Enterprise	No impact		No impact		No impact	No impact
179	Steptoe	No impact				No impact	
210	Coyote Spring	No impact	No impact	No impact	No impact		No impact
219	Muddy River Springs	No impact	No impact	No impact	No impact		No impact
	Curry, NM						
	Hartley, TX[2]						
	Other Affected Subunits or Counties						
5	Pine	High impact	Moderate impact	High impact	No impact	High impact	High impact
49	Parowan	High impact	Moderate impact	High impact	No impact	High impact	High impact
51	Cedar City	High impact	Moderate impact	Moderate impact	No impact	Moderate impact	Moderate impact
	Overall Alternative Impact		Moderate impact	High impact	No impact	High impact	High impact

3921-3

[1]
- No impact. (Prairie dogs are not present for Abundance Index.)
- Low impact.
- Moderate impact.
- High impact. (Prairie dogs are present for Abundance Index.)

[2]Conceptual location of Area Support Centers (ASCs).

Table 4.3.1.9-2. Potential impact to the Utah prairie dog around operating bases (OBs) for the Proposed Action and Alternatives 1-8 (page 2 of 2).

HYDROLOGIC SUBUNIT OR COUNTY		ABUNDANCE INDEX[1]	SHORT- AND LONG-TERM IMPACT[1]			
			ALT. 5	ALT. 6	ALT. 7	ALT. 8
NO.	NAME		MILFORD/ ELY	MILFORD/ COYOTE SPRING	CLOVIS/ DALHART	COYOTE SPRING/ CLOVIS
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert	No impact	No impact	No impact	No impact	No impact
46A	Sevier Desert & Dry Lake[2]	No impact	No impact	No impact	No impact	No impact
50	Milford[2]	No impact	No impact	No impact	No impact	No impact
52	Land District	No impact	No impact	No impact	No impact	No impact
53	Beryl-Enterprise	No impact	No impact	No impact	No impact	No impact
179	Steptoe	No impact	No impact	No impact	No impact	No impact
210	Coyote Spring	No impact	No impact	No impact	No impact	No impact
219	Muddy River Springs	No impact	No impact	No impact	No impact	No impact
	Curry, NM					
	Hartley, TX[2]					
	Other Affected Subunits or Counties					
5	Pine	High	Moderate	Moderate	No impact	No impact
49	Parowan	High	Moderate	Moderate	No impact	Low
51	Cedar City	High	Moderate	Moderate	No impact	No impact
	Overall Alternative Impact	No impact	Moderate	Moderate	No impact	No impact

3921-3

[1]
- No impact. (Prairie dogs are not present for Abundance Index.)
- Low impact.
- Moderate impact.
- High impact. (Prairie dogs are present for Abundance Index.)

[2]Conceptual location of Area Support Centers (ASCs).

Mitigations may be difficult in Parowan Valley because much of the land is privately owned. Fencing and posting of no shooting signs may help restrict human harassment. Utah prairie dog areas can also be posted and the significance of this species explained. Given the nuisance value of prairie dogs to farmers and ranchers, such attempts on private land may be resisted or may even attract more hunters. Transplantation of prairie dogs from sites of likely human impact, to areas of good habitat within their historic range under state or federal jurisdiction may partially mitigate the effects of human activity. Transplantation has already been implemented from private lands into Pine Valley, Utah.

ALTERNATIVE 1 (4.3.1.9.2.3)

DDA Impacts

DDA effects are the same as those for the Proposed Action.

Coyote Spring Valley OB Impacts

Impacts from the Coyote Spring OB are identical to those under the Proposed Action.

Beryl OB Impacts

Impacts from the second OB at (see Figure 4.3.1.9-5) Beryl would consist solely of indirect effects from people-related activities. The second OB site at Beryl would have a peak human population of 17,400 and a long-term population of 12,800. No direct loss of prairie dog habitat would occur as a result of OB construction. This OB site is the only one close enough to Utah prairie dog range in southern Pine Valley (18 to 20 mi) to potentially significantly impact this species. Currently a dirt road provides access from the Beryl OB site into southern Pine Valley. ORV activity in Pine Valley could disrupt prairie dog habitat through loss of vegetation, collapsing of burrows, and noise. Unlike Parowan Valley, where human recreational activities are restricted because of the high proportion of private lands, Pine Valley is readily accessible and use is virtually unrestricted. Although most recreation would be confined to areas closer to the Beryl OB, some effects from ORV's would be likely in Pine Valley, and prairie dog habitat could be impacted. Also unlike Parowan, Pine is near an OB site where long-term human activity would be concentrated. Although the magnitude of the indirect effects may not be great, the fact that this species is federally listed as endangered makes any but the most trivial impacts significant.

Table 4.3.1.9-2 indicates the occurrence and significant impact upon Utah prairie dog under Alternative 1.

BLM restriction of ORV use through fencing, posting of signs prohibiting ORVs, and law enforcement patrols would partially mitigate indirect effects. However, restrictions on ORV use are very difficult to enforce and fencing the western range is generally not encouraged. Transplantation of prairie dogs into new habitat, plus habitat enhancement through control of livestock grazing, would also help mitigate effects.

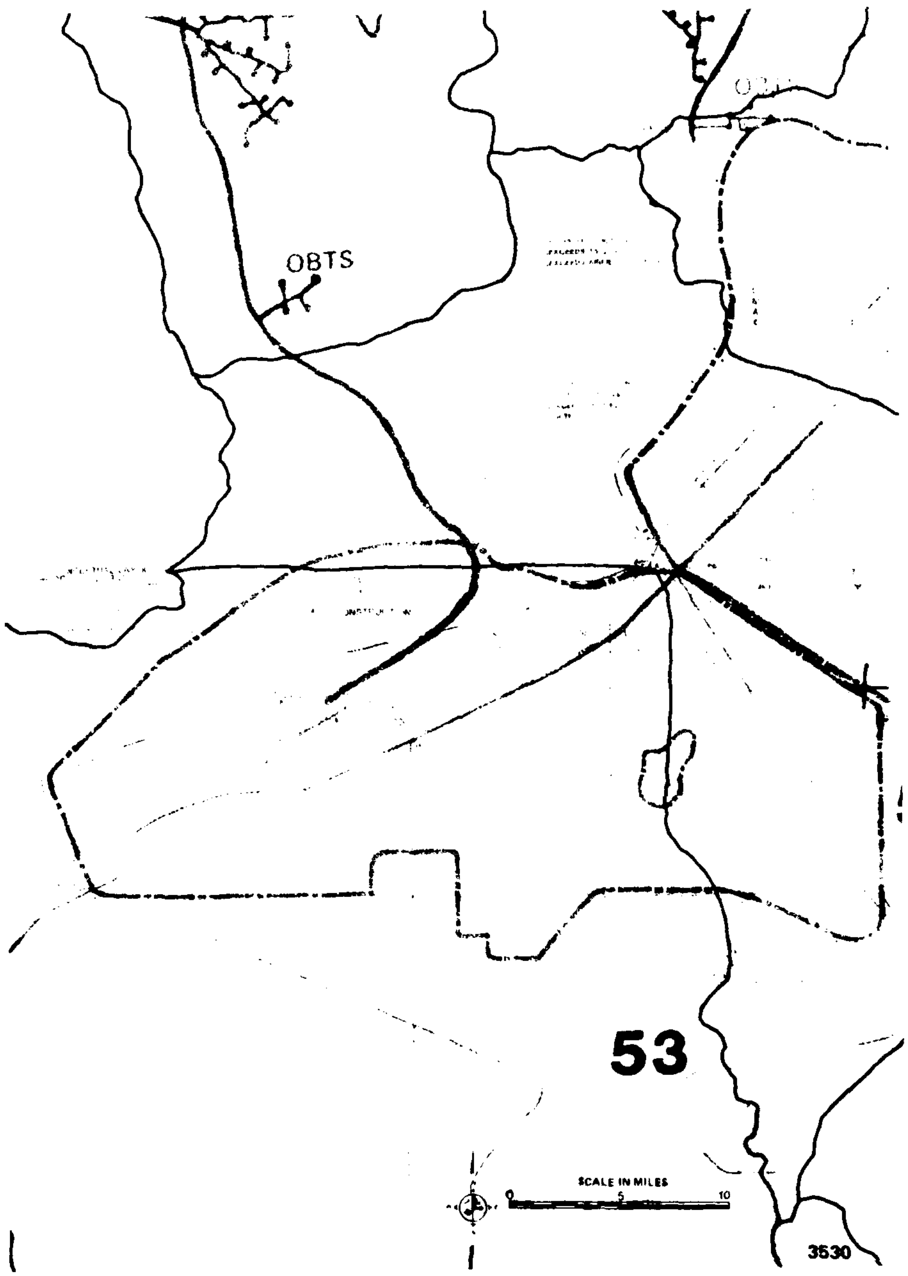


Figure 4.3.1.9-5. Distribution of the Utah prairie dog in the vicinity of the Beryl OB.

ALTERNATIVE 2 (4.3.1.9.2.4)

DDA effects and Coyote Spring OB effects are the same as for the proposed action. Utah prairie dog would not be significantly affected by the OB site at Delta.

ALTERNATIVE 3 (4.3.2.8.2.5)

DDA effects are the same as for the Proposed Action.

Figure 4.3.1.9-5 overlays the Beryl OB site with the portion of DTN passing through Pine Valley, Utah, to Beryl, onto a distribution map of Utah prairie dog.

Effects upon the Utah Prairie Dog from M-X deployment would fall into two categories: direct loss of habitat and effects from human presence. Utah Prairie Dogs are currently found only in southern Pine Valley Utah, within the M-X deployment area. Under Alternative 3 the first OB would be located at Beryl, Utah and a portion of DTN would be extended from Beryl through Pine Valley to connect with clusters in that hydrological subunit. This stretch of DTN would bisect prairie dog range. The DTN is estimated to remove 100 ft of habitat along its length, resulting in a direct loss of only 18 to 20 acres of Utah Prairie Dog habitat. Total habitat in Pine Valley is estimated at 26,300 acres, which means 0.07 percent of total range is removed.

Indirect effects from human activity would be greatest under Alternative 3 since Beryl is the first OB site with a projected peak population of approximately 17,400, and a long-term population of approximately 12,800, and the DTN from Beryl into Pine Valley would provide a convenient corridor for the flow of recreationists into this valley. The major attractant of Pine Valley could be for ORV activity. Increased traffic would likely increase prairie dog road kills in dog towns immediately adjacent to the road, but prairie dogs in other towns are unlikely to be affected. No information currently exists on the significance of road kills on prairie dog populations. Other effects would be comparable to those discussed for the Proposed Action.

No other projects would have a cumulative effect with M-X OB sites.

The loss of 18 to 20 acres of prairie dog habitat would result in a drop in prairie dog population approximately in direct proportion to this loss (i.e., less than 0.1 percent). This situation occurs because prairie dogs are closely tied to their burrow complexes and retreat into them to escape danger or disturbance. Scarification would likely eliminate all prairie dogs within that 18 to 20 acre area. Since this loss of habitat would be permanent, no recovery to the current population level would occur.

Indirect effects upon prairie dogs such as discussed above are difficult to quantify. The amount of road kill increase would depend upon the exact alignment of the DTN. If the road bisects a prairie dog town road kills are likely to be higher than if the road is aligned between two dog towns. Prairie dogs other than dispersing juveniles, do not normally travel from town to town and so would not cross the road. ORV activity has the highest potential to significantly impact Utah prairie dog habitat. However, because Beryl would be 20 to 25 mi from Utah prairie dog habitat, little effect from ORV use is likely (Rajala, 1980). Indirect effects

upon the Utah prairie dog would cause a slight reduction in the overall prairie dog population (1 - 2 percent) in the short term. Most indirect effects would likely be confined to one mile on either side of the roadway.

Productivity should decrease less than one percent in the short term, as it directly relates to loss of habitat. Indirect effects may boost this loss of productivity to perhaps 2 percent. Long-term reduction in productivity would probably remain about the same as, or perhaps slightly less (1 percent) than, the short-term reduction in productivity. This potential drop in productivity would not be expected to jeopardize the survival of prairie dog populations.

Loss of 18 to 20 acres of Utah prairie dog habitat would be an irretrievable commitment of resources but no loss of habitat would be considered a significant impact upon this endangered species.

Table 4.3.1.9-2 indicates the occurrence and significance of impact on Utah prairie dog.

The direct loss of habitat from the DTN could be mitigated by shifting the road alignment to the west to avoid the distribution of Utah prairie dogs in Pine Valley. Another mitigation measure would be to route the DTN through the prairie dog distribution, but align the roadway to avoid the dog towns during detailed surveying. Other mitigations have been discussed previously.

ALTERNATIVE 4 (4.3.1.9.2.6)

DDA effects are the same as for the Proposed Action.

Impacts from the Beryl OB site are identical to those discussed under Alternative 3 and Coyote Spring OB site impacts are comparable to those discussed under the Proposed Action.

ALTERNATIVE 5 (4.3.1.9.2.7)

DDA effects are the same as for the Proposed Action.

The Ely OB site would not significantly impact the Utah prairie dog. With a first OB at Milford the peak human population is projected to be 24,200, with a long-term population of 17,200. Effects upon prairie dogs are expected to be slightly higher than were estimated under the Proposed Action because of this greater human population, but the indirect impacts are expected to be moderate.

Table 4.3.1.9-2 indicates the occurrence and significance of impact upon Utah prairie dogs under Alternative 5.

ALTERNATIVE 6 (4.3.1.9.2.8)

DDA effects are the same as for the Proposed Action.

Utah prairie dogs would not be significantly impacted by placing a second OB at Coyote Spring Valley and impacts from the first OB at Milford and identical to those for Alternative 5.

ALTERNATIVE 7 (4.3.1.9.2.9)

Utah prairie dogs do not occur in Texas or New Mexico.

ALTERNATIVE 8 (4.3.1.9.2.10)

DDA effects are the same as for the Proposed Action. Utah prairie dog would not be significantly affected by an OB site at Coyote Spring Valley. Utah prairie dogs do not occur in Texas or New Mexico.

Rare Plants

RARE PLANTS

INTRODUCTION (4.3.1.9.3.1)

There are no federally listed threatened or endangered species in either study region, but several species are rare and are either listed by state agencies or are being considered for federal listing. A plant treated here is a species known or thought to have a small population in its range. A rare plant may be common where it occurs but restricted in distribution, or may be widespread but sparse in occurrence. Many species of rare, endangered, and threatened plants grow in severe or unusual habitats and often possess unique qualities that make them particularly valuable to man: they contribute to ecological and genetic diversity; they commonly stock unstable and unusual habitats; some provide sources of medicines and other chemicals; some serve as bioindicators of minerals and metal ores; some may possess potential value for food crops and horticultural use; and some provide man with sources of aesthetic value. Over 200 species of rare plants in the study area are being considered for protection under federal and state endangered species legislation in Nevada and Western Utah. Twenty-eight are considered in this analysis because of the potential for direct impacts to them.

Impact analysis was performed in three steps: (1) a description of project effects on rare plants, (2) an assessment of the impact (all effects combined) to the species of concern, and (3) a determination of the significance of the impact. Effects were determined by combining baseline information presented in Chapter 3 with project information. Whenever project features such as clusters or DTN appeared to occur over a plotted rare plant location (using a 1:500,000 scale map), that occurrence was counted and summed on a hydrologic subunit basis. The total number of known locations of rare plants in a hydrologic subunit was determined and compared with the number of disturbed locations. Each species was considered individually.

Due to locational uncertainty, rare plants within 1 mile of project features were considered to have the potential for being directly impacted. They may also receive impacts as a result of ORV activity. Potential recreational ORV use is likely to occur, but on the basis of available data, the extent of the effects of this activity cannot be predicted. The significance of the impact was arrived at by

considering the impact of the project on the distribution and abundance of the individual species (Table 4.3.1.9-3) within the project area.

The following points should be considered when analyzing the following discussion of impacts:

1) Undetected locations of rare species may be present and may be significantly affected by the project. However, hydrologic subunits with no known locations were given a no impact rating based on available data.

2) The number of rare plant locations per hydrologic subunit is difficult to quantify accurately. Locations can be made up of individual plants, or they can be large populations. Collections may have been made in the same location by more than one scientist, leading to duplication. Inherent in this is the problem of defining the limits of the population. "In the field of population genetics a population is often regarded as a naturally occurring group of individuals which share a common gene pool. Such a concept is difficult to apply upon superficial examination of an assemblage of individuals observed in nature." (Welsh & Neese, 1980). Often in mapping rare plant locations, one finds the available information difficult to translate into a point location.

3) The number of known locations in a hydrologic subunit may not be an accurate reflection of rare species diversity for that area. For example, nine known rare plant locations in Hot Creek Valley are within one mile of project elements, as shown in Figure 4.3.1.9.3-1. In this case, the nine locations are all of the same rare species, the *Callaway milkvetch* (Astragalus callithrix). *By contrast, in Hamlin* Valley six locations of four different species occur within 1 mi of project elements.

PROPOSED ACTION (4.3.1.9.2.2)

DDA Impacts

Figure 4.3.1.9-6 shows locations of rare plants affected by the Proposed Action. Project effects involve either the complete removal of the rare plant (vegetation clearing) and/or alteration of its habitat. Habitat is usually a specific substrate type; a region where substantial moisture is found; a region where the correct biological "link" is found; or a combination of the above factors. Rare plants are usually tied, in some way, to a specific habitat. Destruction or alteration of this habitat decreases the viability of the rare species. Reinvasion of altered habitats by many rare species is extremely slow. Thus, the overall abundance and distribution is decreased by alteration of the habitat. Habitat disruption also could damage, remove or inhibit expansion of rare plant populations. Such habitat disruption could be caused by erosion, compaction, sedimentation and off-road vehicle use.

Project actions that potentially affect rare plants are: (1) construction of permanent roads (e.g., DTN and cluster), protective structures, buildings, parking areas and airfields; (2) excavation of quarries and borrow pits; (3) construction and operation of cement and aggregate plants; and (4) increased personnel access, including security patrols and off-road recreational activities. These actions generally involve removal of plants by clearing and grubbing and deposition of excavated material, and increased use of off-road areas by vehicles. Rare plants are potentially affected by these actions primarily because they may be damaged or removed or their habitat may be modified, as stated above.

Table 4.3.1.9-3. Potential impact to rare plants in Nevada/Utah and Texas/New Mexico[1] which could occur as a result of DDA and OB[2] construction for the Proposed Action and Alternatives 1-8.[3]

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	TOTAL NUMBER OF KNOWN RARE PLANT LOCATIONS	NUMBER OF PLACES WHERE DAA AND OB FEATURES COULD DIRECTLY AFFECT RARE PLANT LOCATIONS	NUMBER OF RARE PLANT SPECIES WHICH COULD BE AFFECTED	SHORT AND LONG-TERM POTENTIAL IMPACT[3] FOR PROPOSED ACTION & ALTS. 1-6	SHORT AND LONG-TERM POTENTIAL IMPACT[3] FOR ALT. 8
	Subunits with M-X Clusters and DTN					
4	Snake	37	6	4	Moderate	Moderate
5	Pine	36	6	4	High	High
6	White	6	2	2	High	High
7	Fish Springs	1	0	0	No impact	No impact
8	Dugway	0	0	0	No impact	
9	Government Creek	0	0	0	No impact	
46	Sevier Desert	3	1	2	Low	Low
46A	Sevier Desert & Dry Lake[4,5]	4	4	1	Moderate	Moderate
54	Wah Wah	11	3	3	High	High
137A	Big Smoky-Tonopah Flat	19	3	3	Moderate	
139	Kobeh	3	2	2	Low	
140A	Monitor—Northern	3	3	2	Moderate	
140B	Monitor—Southern	6	0	0	No impact	
141	Ralston	32	11	8	Moderate	
142	Alkali Spring	2	0	0	No impact	
148	Cactus Flat	42	0	0	No impact	
149	Stone Cabin[4]	21	7	3	Moderate	
151	Antelope	2	0	0	No impact	
154	Newark[4]	1	0	0	No impact	
155A	Little Smoky—Northern	2	0	0	No impact	
155C	Little Smoky—Southern	0	0	0	No impact	No impact
156	Hot Creek	17	9	1	High	High
170	Penoyer	0	0	0	No impact	No impact
171	Coal[5]	2	0	0	No impact	No impact
172	Garden	6	2	2	Low	Low
173A	Railroad—Southern	0	0	0	No impact	No impact
173B	Railroad—Northern	28	13	7	High	High
174	Jakes	1	0	0	No impact	
175	Long	0	0	0	No impact	
178B	Butte—South	0	0	0	No impact	
179	Steptoe	24	0	0	No impact	
180	Cave	0	0	0	No impact	No impact
181	Dry Lake[4,5]	0	0	0	No impact	No impact
182	Delamar	0	0	0	No impact	No impact
183	Lake	0	0	0	No impact	No impact
184	Spring	25	1	1	Low	Low
196	Hamlin	15	6	4	High	High
202	Patterson	0	0	0	No impact	No impact
207	White River[4]	27	8	5	Moderate	Moderate
208	Pahroc	1	0	0	No impact	
209	Pahranagat	13	1	1	Low	
	Overall DDA, P.A. & Alts. 1-6	484	90	—	High	
	Overall DDA, Alt. 8	218	61	—		High

3900-2

[1]No rare plant species are anticipated to be significantly affected as a result of M-X deployment in Texas/New Mexico.

[2]No direct impact to rare plant species is anticipated at operating bases. See text for discussion of potential impact to species occurring within suitability zones.

[3]

No impact. (No known locations of rare plant species would be affected by the conceptual layout.)

Low impact. (Potential loss of 15 percent or less of known locations of any rare plant species.)

Moderate impact. (Potential loss of more than 15 percent of known locations of any rare plant species or where four or more different species could be affected.)

High impact. (Affected species include those which have high priority for federal listing.)

[4]Conceptual location of Area Support Centers (ASCs) for Proposed Action and Alternatives 1-6.

[5]Conceptual location of Area Support Centers (ASCs) for Alternative 8.

RARE PLANTS LEGEND

NUMBER	SPECIES
1	*Agave utabensis* var. *eborispina*
3	*Angelica scabrida*
4	*Antennaria arcuata*
5	*A. soliceps*
6	*Arabis dispar*
8	*Arctomecon californica*
9	*A. bumilis*
10	*A. merriamii*
11	*Arenaria kingii* var. *rosea*
12	*A. stenomeres*
14	*Asclepias eastwoodiana*
15	*Astragalus aequalis*
16	*A. alvordensis*
17	*A. ampullarius*
18	*A. beatleyae*
19	*A. callitbrix*
20	*A. calycosus* var. *monopbyllidius*
21	*A. convallarius* var. *finitimus*
22	*A. funerus*
23	*A. geyeri* var. *triquetrus*
24	*A. lancearius*
25	*A. lentiginosus* var. *latus*
26	*A. l.* var. *micans*
27	*A. l.* var. *sesquimetralis*
28	*A. l.* var. *ursinus*
29	*A. limnocharis*
30	*A. mohavensis* var. *hemigyrus*
31	*A. musimonum*
32	*A. nyensis*
33	*A. perianus*
34	*A. oophorus* var. *clokeyanus*
35	*A. o.* var. *lonchocalyx*
36	*A. phoenix*
37	*A. porrectus*
38	*A. pseudiodanthus*
39	*A. pterocarpus*
39a	*A. robbinsii* var. *occidentalis*
40	*A. serenoi* var. *sordescens*
41	*A. solitarius*
42	*A. striatiflorus*
43	*A. tephrodes* var. *eurylobus*
44	*A. toquimanus*
45	*A. uncialis*
48	*Calochortus striatus*
49	*C. sp. (Ash Meadows)*
50	*Camissonia megalantha*
51	*C. nevadensis*
53	*Castilleja parvula*
54	*C. salsuginosa*
55	*Centaurium namophilum*
56	*Cirsium clokeyi*
57	*Cordylanthus tecopensis*
58	*Coryphantha vivpara* var. *rosea*
59	*Cryptantha compacta*
60	*C. hoffmanni*
61	*C. insolita*
62	*C. interrupta*
63	*C. tumulosa*
64	*Cuscuta warneri*
65	*C. basalticus*
67	*Cymopterus coulteri*
68	*C. minimus*
69	*C. nivalis*
71	*C. goodrichii*
72	*Dalea kingii*
73	*Draba arida*
74	*D. asperella* var. *zionis*
75	*D. asterophora* var. *asterophora*
76	*D. crassifolia* var. *nevadensis*
78	*D. jaegeri*
79	*D. paucifructa*
79a	*D. sobolifera*
80	*D. sphaeroides* var. *cusickii*
81	*D. stenoloba* var. *ramosa*
82	*D. subalpina*
83	*Echinocereus engelmannii* var. *purpureus*
84	*Elodea nevadensis*
85	*Enceliopsis nudicaulis* var. *corrugata*
87	*Epilobium nevadense*
88	*Erigeron latus*
89	*E. ovinus*
90	*E. proselyticus*
91	*E. religiosus*
92	*E. uncialis* var. *conjugans*
93	*Eriogonum ammophilum*
94	*E. anemophilum*
95	*E. argophyllum*
95a	*E. beatleyae*
96	*E. bifurcatum*
98	*E. corymbosum* var. *matthewsiae*
99	*E. darrovii*
100	*E. eremicum*
101	*E. holmgrenii*
102	*E. jamesii* var. *rupicola*
103	*E. lemmonii*
104	*E. lobbii* var. *robustius*
105	*E. natum*
105a	*E. nummulare*
106	*E. ostlundii*
109	*E. panguicense* var. *alpestre*
110	*E. rubricaule*
111	*E. thompsonae* var. *albiflorum*
112	*E. viscidulum*
113	*E. zion* var. *zionis*
115	*Forsellesia pungens*
116	*Frasera gypsicola*
117	*F. pahutensis*
118	*Fraxinus cuspidata* var. *macropetala*
119	*Galium hilendiae* ssp. *kingstonense*
120	*Geranium toquimense*
121	*Gilia nyensis*
122	*G. ripleyi*
123	*Grindelia fraxino-pratensis*
124	*Hackelia ophiobia*
125	*H. alpinus*
128	*H. watsoni*
129	*Helianthus deserticolus*
130	*Heuchera duranii*
132	*Hymenopappus filifolius* var. *tomentosus*
133	*Ivesia cryptocaulis*
134	*I. eremica*
135	*Lathyrus hitchcockianus*
136	*Lepidium nanum*
136a	*L. ostleri*
137	*Lesquerella hitchcockii*
138	*Lewisia maguirei*
140	*Lomatium ravenii*
142	*Lupinus jonesii*
143	*L. malacophyllus*
144	*L. montigenus*
145	*Machaeranthera grindelioides* var. *depressa*
146	*M. leucanthemifolia*
147	*Mentzelia leucophylla*
148	*Mertensia toiyabensis*
149	*Mimulus wasboensis*
150	*Mirabilis pudica*
151	*Opuntia pulchella*
152	*O. wbipplei* var. *multigeniculata*
153	*Oryctes nevadensis*
154	*Oxytheca watsonii*
155	*Pediocactus sileri*
156	*Penstemon arenarius*
157	*P. bicolor* spp. *bicolor*
158	*P.b.* spp. *roseus*
159	*P. concinnus*
160	*P. francisci-pennellii*
161	*P. fruticiformis* spp. *amargosae*
162	*P. bumilis* var. *obtusifolius*
163	*P. keckii*
165	*P. nanus*
166	*P. pahutensis*
167	*P. procerus* var. *modestus*
168	*P. pudicus*
169	*P. rubicundus*
170	*P. tbompsoniae* spp. *jaegeri*
171	*P. tburberi* var. *anestius*
172	*P. tidestromii*
173	*P. wardii*
173a	*P. sp. (Deep Creek Mtns.)*
174	*Perityle megalocepbala* var. *intricata*
175	*Peteria thompsonae*
176	*Phacelia anelsonii*
176a	*P. argillaceae*
177	*P. beatleyae*
178	*P. cephalotes*
179	*P. glaberrima*
180	*P. inconspicua*
183	*P. parishii*
184	*Phlox gladiformis*
186	*Polygala subspinosa* var. *beterorbyncba*
187	*Primula capillaris*
188	*P. nevadensis*
189	*Rorippa subumbellata*
190	*Salvia funerea*
191	*Sclerocactus polyancistrus*
192	*S. pubispinus*
193	*Selaginella utabensis*
195	*Silene clokeyi*
196	*S. petersonii* var. *minor*
197	*S. scaposa* var. *lobata*
198	*Smelowskia bolmgrenii*
199	*Spbaeralcea caespitosa*
200	*Spbaeromeria compacta*
201	*S. rutbiae*
202	*Streptantbus oligantbus*
203	*Syntbyris ranunculina*
204	*Tbelypodium laxiflorum*
205	*T. sagittatum* var. *ovalifolium*
206	*Townsendia jonesii* var. *tumulosa*
207	*Trifolium andersonii* spp *beatleyae*
207a	*T. a.* var. *friscanum*
208	*T. lemmonii*
209	*Viola purpurea* var. *cbarlestonensis*
214	*Cymopterus newberryi*
216	*Ditaxis diversiflora*
219a	*Haplopappus abberans*
230	*Polemonium nevadensae*

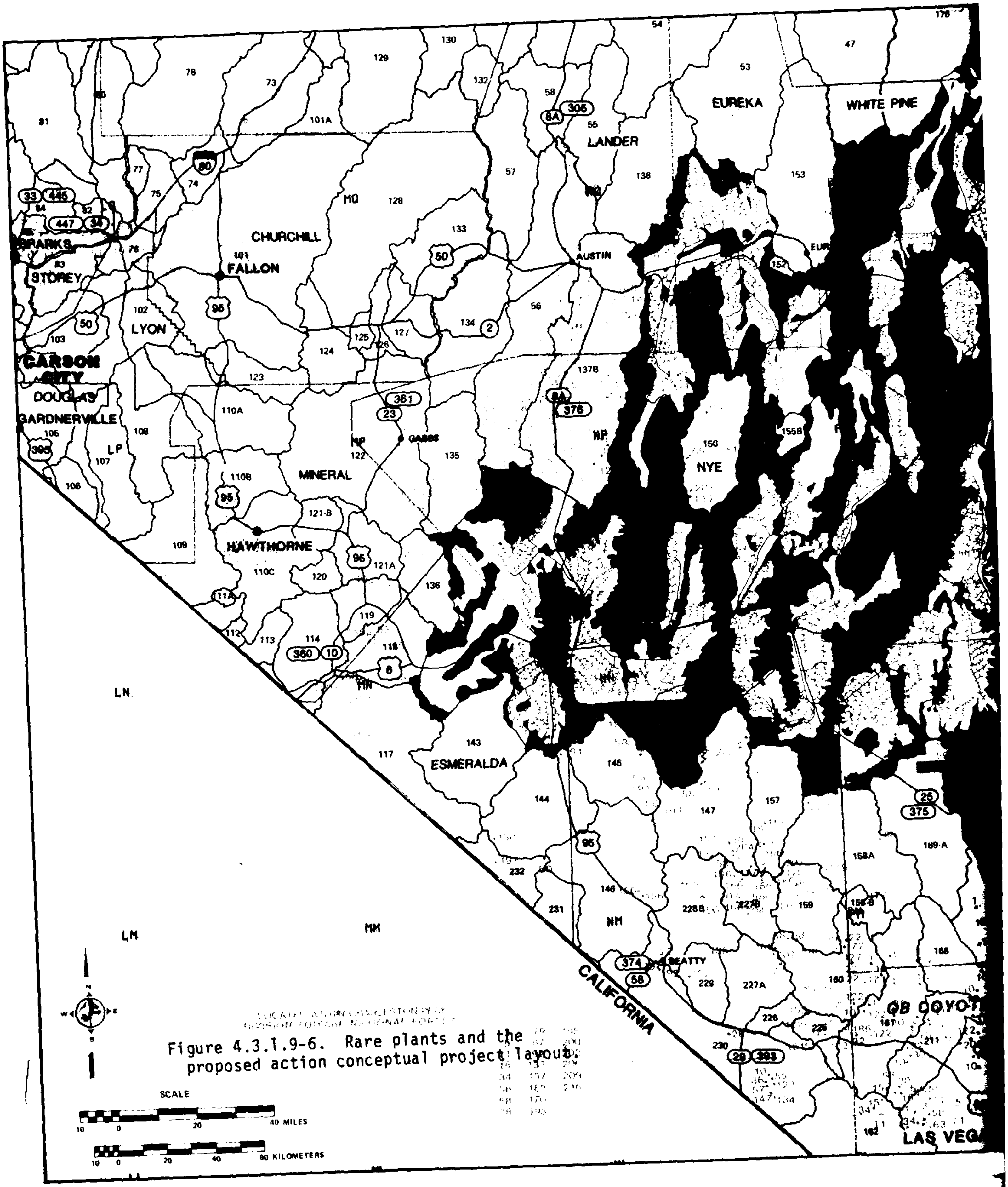
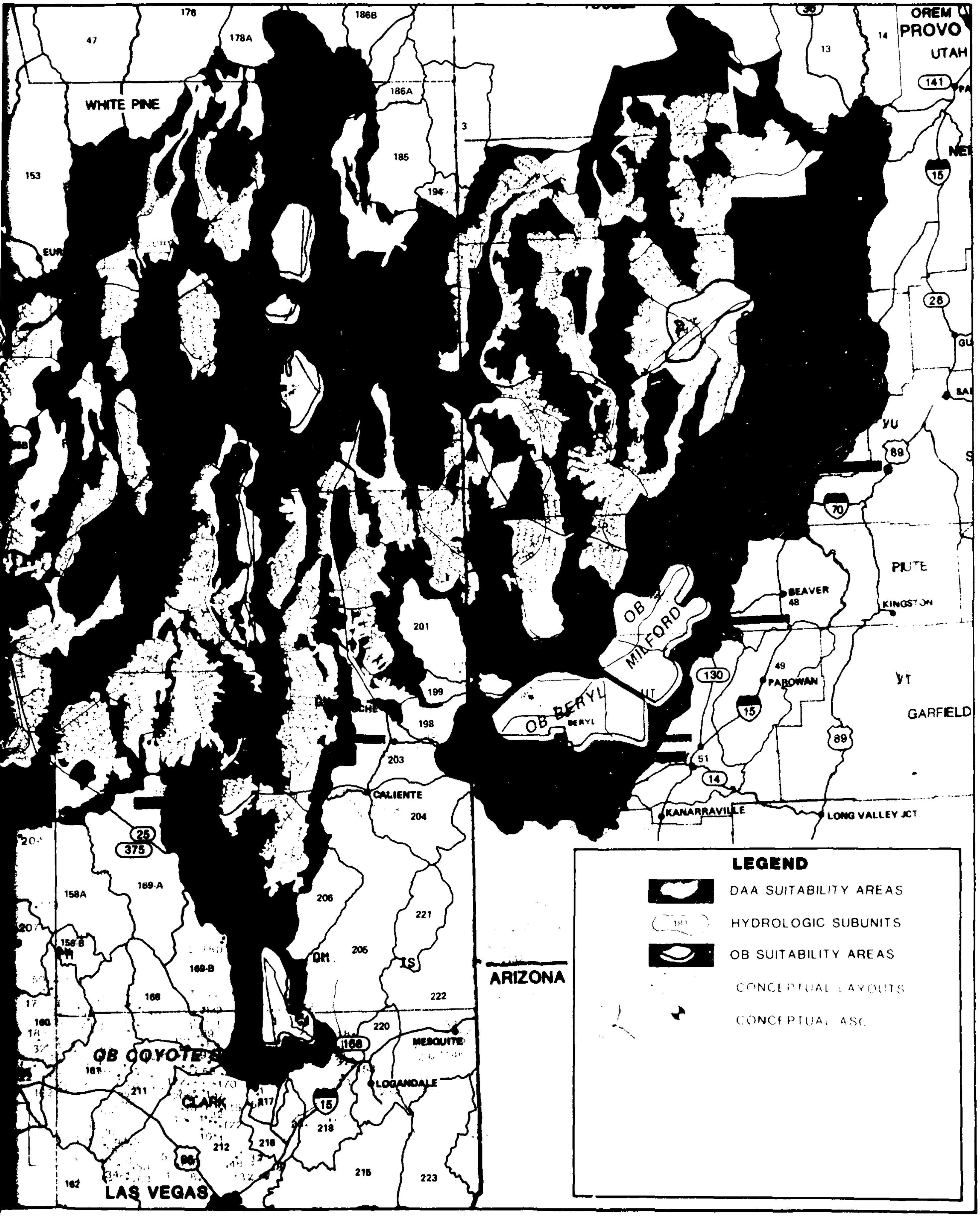
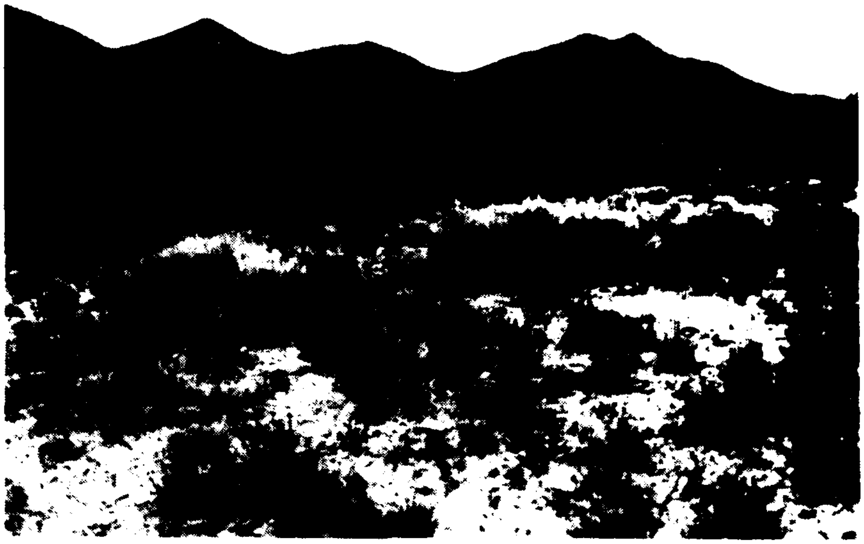


Figure 4.3.1.9-6. Rare plants and the proposed action conceptual project layout.

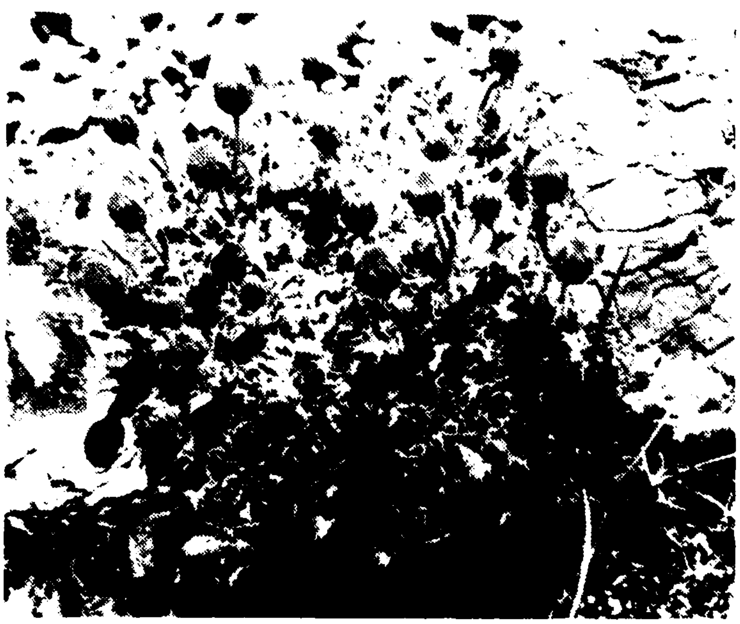

LEGEND
DAA SUITABILITY AREAS
HYDROLOGIC SUBUNITS
OB SUITABILITY AREAS
CONCEPTUAL LAYOUTS
CONCEPTUAL ASC
WHITE PINE
OREM
PROVO
UTAH
OB MILFORD
OB BERYL
BERYL
BEAVER
PIUTE
KINGSTON
PAROWAN
GARFIELD
CALIENTE
KANARRAVILLE
LONG VALLEY JCT
ARIZONA
MESQUITE
LOGANDALE
OB COYOTE
CLARK
LAS VEGAS

3222-D



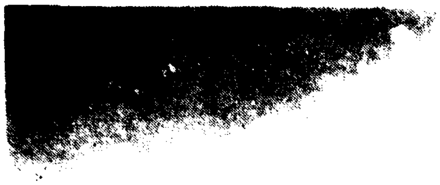
THE DWARF BEARD-TONGUE (*Penstemon nanus*) OCCURS ON GRAVELLY SOIL WITH BLACK SAGEBRUSH, JUNIPER, AND RABBITBRUSH.

2036-A



CALCAREOUS KNOLLS IN OPEN JUNIPER WOODLAND PROVIDE TYPICAL HABITAT FOR THE DWARF GUMWEED MACHAERANTHERA (*Machaeranthera grindelioides* var. *depressa*)

2037 A

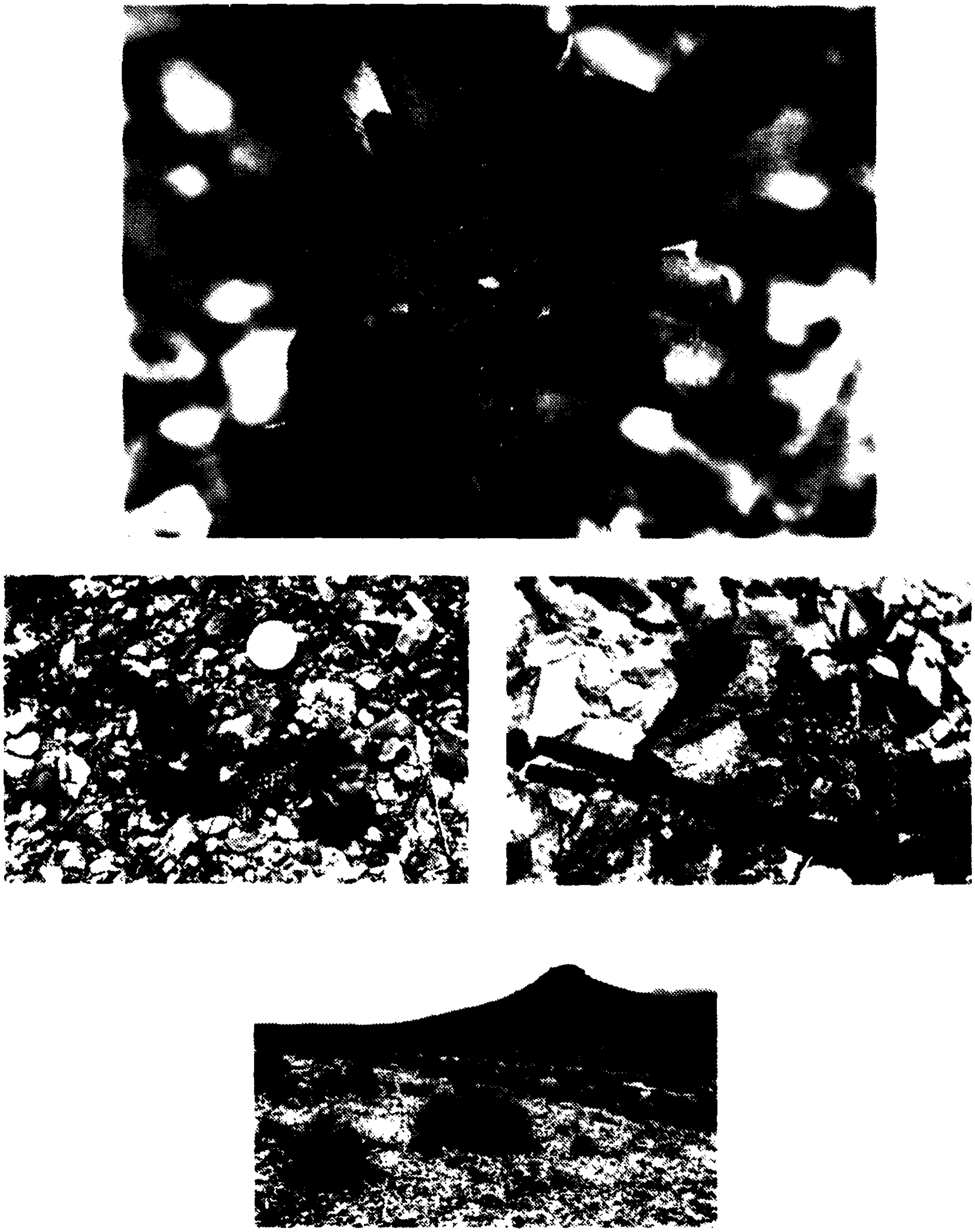


THE WHITE LEAF MACHAERANTHERA (M. *leucanthemifolia*) BELOW, OCCURS IN NUMEROUS HABITAT TYPES, INCLUDING SHADSCALE, SAGEBRUSH, AND PINYON JUNIPER WOODLAND.

2038-5

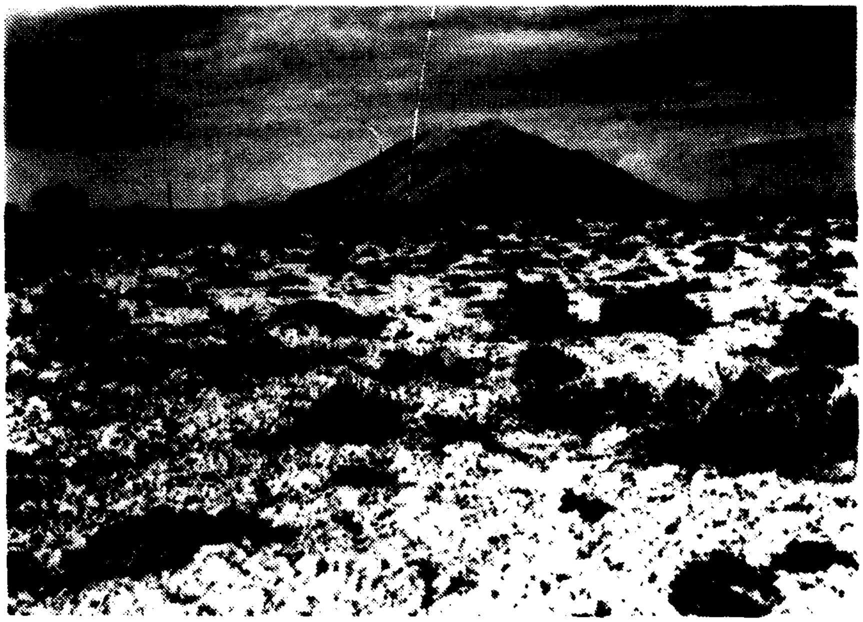
PARTIALLY STABILIZED SAND DUNES PROVIDE SUITABLE HABITAT FOR THE CALLAWAY MILKVETCH (*Astragalus callithrix*), A RARE PLANT WHICH HAS HIGH PRIORITY FOR FEDERAL LISTING.

2039 A



THE SAND CHOLLA (*Opuntia pulchella*) HAS BEEN LOCATED IN ALLUVIAL DRY WASHES. TYPICAL HABITAT ALSO INCLUDES SAND DUNES AND SAGEBRUSH AREAS.

2034-A



DWARF PEPPERGRASS (*Lepidium nanum*) APPEARS TO BE HABITAT SPECIFIC ON WHITE OUTCROPS OF CALCAREOUS PLAYA REMNANT ("GYPSUM MOUNDS") IN WHITE RIVER VALLEY.

2032 A

Twenty-eight rare plant species are within 1 mile of the project layout and have a potential for being directly affected by the Proposed Action. Four of these are species for which rulemaking packages are being developed, and they are likely to become federally listed in the near future (USFWS, 1980).

Indirectly affected species are defined as those occurring some distance away from project features, but may be affected by ORV use. They include those species which occur more than , mile away from project features and especially those species which occur in areas identified as high potential ORV use areas. These species are discussed under the rare plant section of Chapter 4 and in the Protected Species Technical Report (ETA-17). Habitat degradation, crushing of foliage, breakage of stems and uprooting of small plants, all potential impacts resulting from ORV use (Bury et al., 1977; Wilshire, 1978), can cause a decrease in viability, resulting in a decrease in the abundance of the plants and their distributional range.

As the project proceeds during construction and more land is disturbed, direct effects on rare plants will increase. Indirect effects on rare plants involve (1) increased erosion resulting from road building, and (2) increased loss of viability resulting from ORV activity, including crushing of foliage, breakage of stems, and uprooting of plants. ORV activity is expected to increase as a result of recreational activities of an increased population.

Long-term productivity would be affected by permanent removal of rare species as a result of construction of project facilities. Recovery rates for most rare species are not known. Some may be remnants of ancient species and others may be newly-evolved. In regions where a portion of a population remains after scarification, some recovery may occur, but the population would not be likely to regain its present productivity. Halogeton, a toxic annual weed, may invade suitable habitat. This extends the time required for recovery of the native vegetation beyond the life of the project and therefore affects long-term productivity.

Scarification, a direct effect which involves clearing of land for the purposes of building roads or other project features, will result in an irretrievable resource commitment if it involves the loss of rare plants. Species lost in this manner cannot be replaced.

Approximately 20 percent of the known locations of rare plants in the hydrologic subunits where the DDA is located are within one mile of projected elements. Many of these rare plants are found in localized habitat and there is a high probability that certain species may become locally extirpated as a result of M-X. Exact distributions for rare plant species in the Great Basin are not known. Available data suggest that for some species, the Proposed Action has the potential to alter a high percentage of all known habitat or cause the loss of many known locations. For example, the Callaway milkvetch (Astragalus callithrix) is found in five valleys in the Great Basin. In four valleys it is potentially affected by the project as proposed. It is highly restricted in distribution and does not occur outside a very limited area of deep yellow sand (Barneby, 1942).

Construction and operation could result in the permanent loss of individual rare plants. Table 4.3.1.9-3 summarizes effects on rare plants on a valley-by-valley basis. It includes the number of locations potentially affected, the total number of locations, the number of species affected, and the significance of the impact.

Significance is considered on four levels. Level 1 applies to hydrologic subunits for which no impact is anticipated. Level 2 (low to moderate impact) applies to hydrologic subunits containing any rare species, which potentially loses 15 percent or fewer of its known locations in the project area. Level 3 (moderate to high) applies to hydrologic subunits containing any rare species which potentially loses more than 15 percent of its known locations in the project area, or which contain more than 4 species potentially affected. The fourth and highest level of impact includes hydrologic subunits that contain species likely to be federally listed in the near future. The significance levels were arrived at by a process (discussed further in ETA-17) which involved the following steps: (1) determination of the species affected by the project and the total number of locations of them in the area; (2) determination of the number of times the individual species were affected in the hydrologic subunit; (3) determination, based on the above information, of a "species/watershed" index number which was weighted more heavily for species greatly affected. The "species/watershed" index numbers were summed for each hydrologic subunit and a total for that hydrologic subunit was termed "hydrologic subunit index number. This relates directly to the significance levels as discussed above.

This analysis shows that M-X has the potential to cause a substantial decrease in the abundance of three rare species: Astragalus callithrix, Eriogonum ammophilum, and E. natum. Except for one location of Astragalus callithrix, they are not known outside the project area and would be affected by project activity at each known location.

The impact of rare plant species can be greatly reduced by relocating project facilities to avoid these species. Although no plant species in the project area are currently Federally listed, nine species are under review by the U.S. Fish and Wildlife Service (USFWS) and have a high potential for listing. Four of these occur in the DDA. In addition to the nine species currently under consideration by the USFWS, a significant number of other rare plants are of concern to the USFWS and could be emergency listed (using fast-track procedures) as a result of planned M-X development. The avoidance of listed and non-listed species would reduce the impact to rare plants. Tiered decision making, described in Chapter 1, presents a generic discussion of the sequence of environmental studies and decisions associated with detailed siting.

Indirect impacts to rare species, in the vicinity of the project, such as from sedimentation, flooding and dust, could be reduced by implementation of an erosion control and revegetation plan. Limiting off-road vehicle use by construction and operation personnel, and provision of aid to land management agencies in the control of public off-road vehicle use would reduce the potential indirect impacts to rare plants.

Coyote Spring Valley OB Impacts

One rare plant species, the Steno sandwort (Arenaria stenomeres), occurs just outside the suitability zone of the Coyote Spring operating base (Figure 4.3.1.9-7) and within 2 mi of the conceptual operating base. Within the boundary of the Desert National Wildlife Range, two other localities for this species have been mapped (Nevada State Museum, 1980). These are the only known locations of the plant. Indirect impacts resulting from ORV use and recreational use could alter habitat for this species resulting in a possible decrease in its abundance or a narrowing of its

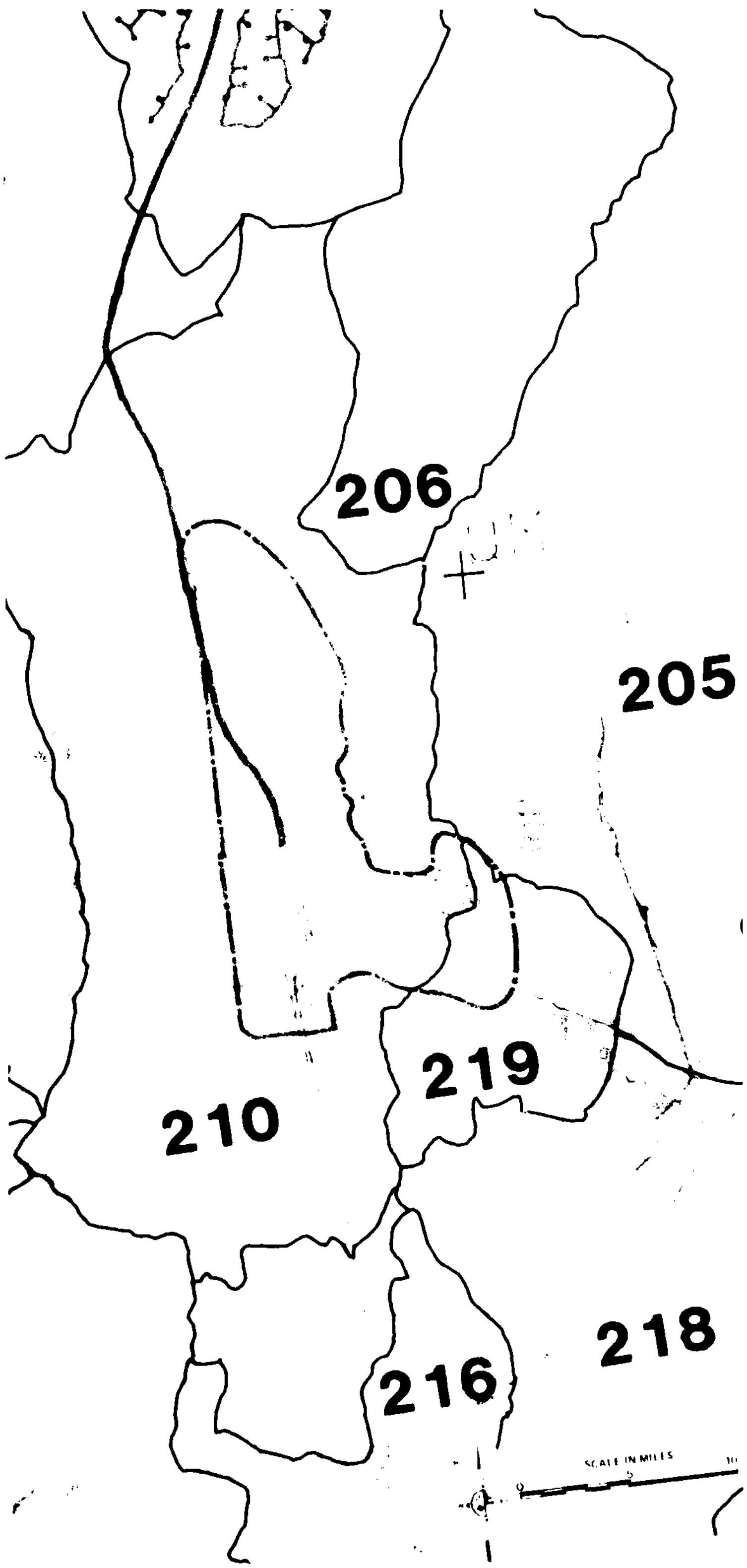


Figure 4.3.1.9-7. Rare plants in the Coyote Spring OB vicinity.

distribution. Quarry sites used for highway construction or improvement may involve habitat removal. Relocation of the operating base within the suitability zone could directly impact the Steno sandwort which is protected by the State of Nevada.

Milford OB Impacts

There are no direct impacts to rare plants anticipated from vegetation clearing for construction of the Milford operating base. However, indirect impacts as a result of recreational activity may occur.

ALTERNATIVE 1 (4.3.1.9.3.3)

Impacts in the DDA and at the Coyote Spring OB are the same as those for the Proposed Action. There are no direct impacts to rare plants anticipated as a result of actions involved in construction and operation of the second OB at Beryl (Figure 4.3.1.9-8). As for all OB sites, previously undetected populations may be located during site-specific studies.

ALTERNATIVE 2 (4.3.1.9.3.4)

Impacts in the DDA and at the Coyote Spring OB would be the same as those for the Proposed Action. One known location of the terrace buckwheat (Eriogonum natum) occurs within the suitability zone of the Delta OB (Figure 4.3.1.9-9). This endemic species, discovered in 1975 (Reveal), has been recommended for threatened status (Welsh and Thorne, 1979). Only five locations are currently documented, all in Millard County, Utah. The plant has been found on "low white alkaline clay outcrops" in the Sevier Lake area (Welsh et al., 1975). Most of these locations are near the 5,000 ft elevation level, and it is likely that more locations could be found in the surrounding area. Two of the five locations are intersected by clusters in the conceptual layout. Construction of the operating base facilities or ORV activity in this area would be likely to affect the habitat of this rare species.

ALTERNATIVE 3 (4.3.1.9.3.5)

Impacts in the DDA are the same as those for the Proposed Action. Impacts at the Beryl OB are the same as those for Alternative 1, except that in this case the OB includes a DAA and an OBTS. More extensive indirect effects may result from a higher population level.

Three rare plant species occur at Monte Neva Hot Springs, within the boundaries of the Ely OB suitability zone. They are the Monte Neva Indian paintbrush (Castilleja salsuginosa), the spring-loving centaury (Centarium namophilum), and the sheathed death camus (Zigadenus vaginatus). Figure 4.3.1.9-10 shows the locations of these species. The paintbrush is one species which the USFWS is considering a rulemaking package for, since this is the only known location. It may become a listed species within the next two or three years (Shields, 1980). The centaury, an annual, and the death camus, a lily-family member, are recommended endangered and recommended threatened, respectively. Available information indicates that all three species occur on private land, but they may be affected by a change in surface or groundwater levels (Heckard, 1980).

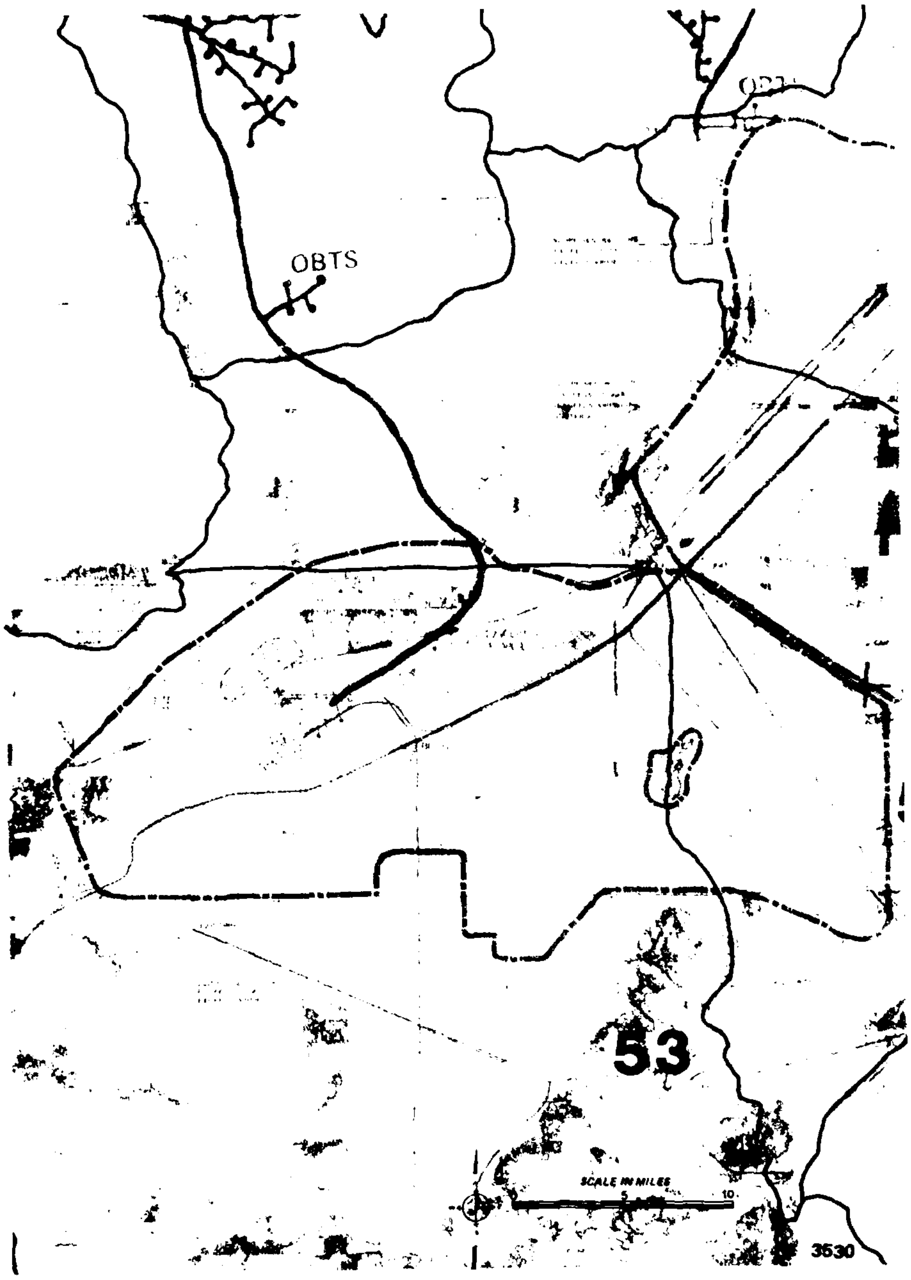


Figure 4.3.1.9-8. Rare plants in the Beryl OB vicinity.

Figure 4.3.1.9-9. Rare plants in the Delta OB vicinity.

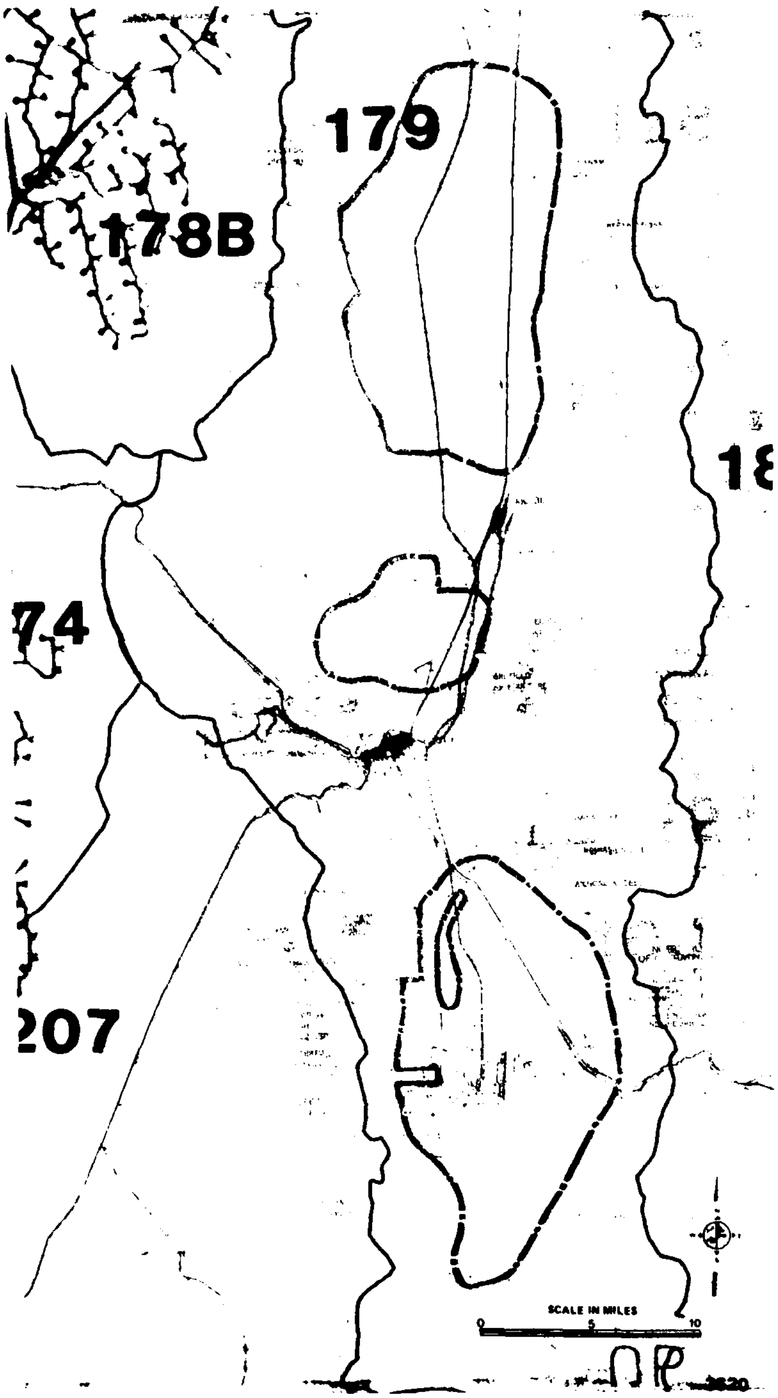


Figure 4.3.1.9-10. Rare plants in the Ely OB vicinity.

The effects of recreational activity in the area may pose a substantial risk to the species, as the hot springs site was once used as a resort. Local population growth could restore the viability of the site for resort use, and thereby affect the species.

ALTERNATIVE 4 (4.3.1.9.3.6)

Impacts in DDA are the same as those for the Proposed Action. Impacts at the Beryl OB are the same as those for Alternative 3. For the Coyote Spring OB, impacts are the same as those for the Proposed Action except that there would be no DAA or OBTS. The presence or absence of these features does not change the impacts.

ALTERNATIVE 5 (4.3.1.9.3.7)

Impacts in DDA are the same as those for the Proposed Action. No direct impacts to rare plants are anticipated to result from construction and operation of the Milford OB. There are no known locations in the vicinity of the DAA, OBTS, or OB. Indirect impacts as a result of recreational activity cannot be quantified. Impacts at the Ely OB are the same as those for Alternative 3.

ALTERNATIVE 6 (4.3.1.9.3.8)

Impacts in the DDA are the same as those for the Proposed Action. Impacts at Milford are the same as those for Alternative 5, and impacts at Coyote Spring are the same as those for Alternative 4.

ALTERNATIVE 7 (4.3.1.9.3.9)

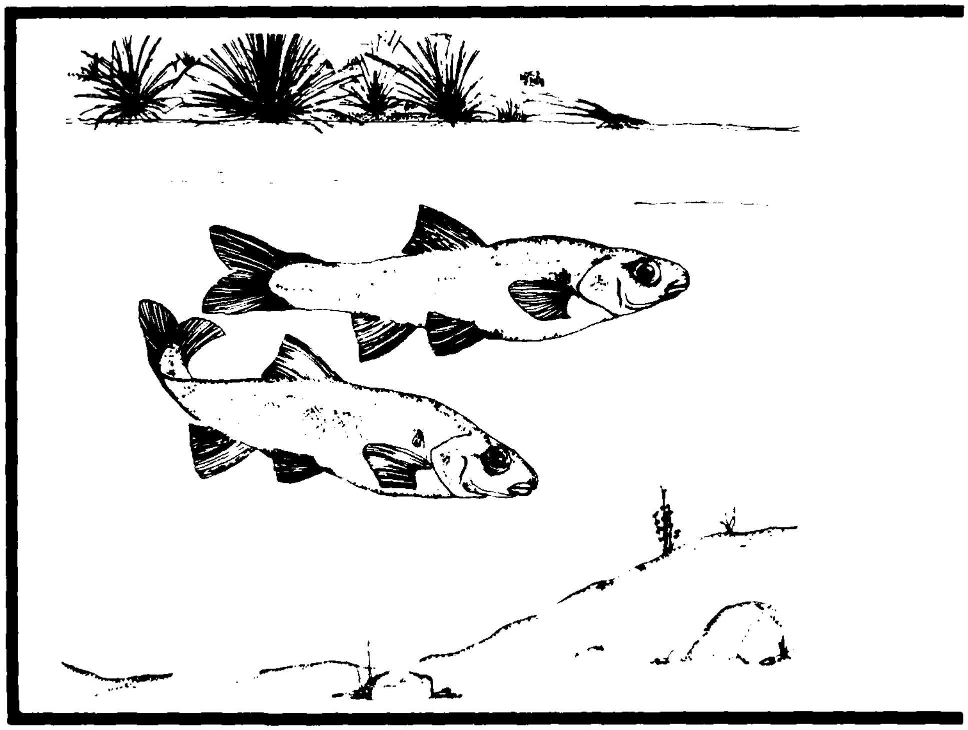
No significant impacts to rare plants in the Texas/New Mexico area can be predicted on the basis of available data. The few specific locations known are outside the DDA. Suitable habitat for rare plant species apparently does not exist in the immediate vicinity of the Clovis or Dalhart OB sites, due to intensive agricultural activity in the area.

ALTERNATIVE 8 (4.3.1.9.3.10)

Impacts are the same as those for the Proposed Action, except that only half the number of valleys are involved in Nevada and Utah. Clearly, the decrease in the number of valleys involved reduces the number of potentially directly affected rare species locations. Sixty-one known rare plant locations would be directly affected (i.e., within one mile of) by the split-basing DDA compared to 90 under the Proposed Action. In Texas and New Mexico, no significant impacts to rare plants can be predicted on the basis of available data. Specific locations are known for only a few species, and these are out of the DDA.

Impacts at the OB would be comparable to those for the Proposed Action and Alternative 7.

Aquatic Species



AQUATIC SPECIES

INTRODUCTION (4.3.1.9.4.1)

The primary method for estimating direct impact on protected aquatic species was to overlay the conceptual project layout on a map showing known locations of the resource. Impacts were estimated considering habitat requirements of species of concern and effects of project activities, from several processes, including erosion and surface and groundwater and transport. With the exception of impacts related to groundwater withdrawal, a critical radius of direct impact on aquatic habitats has been established at 1-5 mi.

The significance of the predicted impacts was estimated by the following: (1) what is the effect of the disturbance on the viability of the resource, (2) to what extent will the effect be masked by normal variation expressed by the resource, (3) how rapidly will the resource recover from temporary disturbance, (4) what is the scientific or intrinsic value of the resource, (5) to what extent is the resource limited by a process which has already been set in motion, (6) are the consequences such that the ecosystem will not recover at all, (7) are the consequences such that the impact may be large but the recovery process will overcome the damage in a reasonable period of time, (8) are the deleterious effects measurable, and, (9) to what extent will funding be required to mitigate the effects on the resource. More detailed and site-specific analysis will be performed after a siting region has been selected. This is consistent with the tiering concept discussed in Section 1.7.2.

PROPOSED ACTION (4.3.1.9.4.2)

DDA Impacts

The distribution of federally and state protected aquatic species and the Proposed Action are shown on Figure 4.3.1.9-11. Construction and operation of the M-X project in the Great Basin desert may impact protected aquatic species directly through: 1) habitat disturbance, 2) altered runoff patterns, 3) addition of pollutants, and 4) groundwater withdrawal. The last is most difficult to assess, yet most likely to cause adverse impacts. Indirect impacts would largely result from recreation activities. Recreational activities of concern include fishing, camping, swimming and use of off-road vehicles. The introduction of exotic aquatic species may also occur.

PROTECTED FISH SPECIES

LEGEND

PROTECTED FISH SPECIES FOR NEVADA AND UTAH

A ASH MEADOWS AMARGOSA PUPFISH
B CUI UI*
C RELICT DACE
E RAILROAD VALLEY SPRINGFISH
F UTAH OR SNAKE VALLEY CUTTHROAT TROUT
G WARM SPRINGS AMARGOSA PUPFISH*
H DEVIL'S HOLE PUPFISH*
I BIG SPRING SPINEDACE
J WHITE RIVER SPINEDACE
K WHITE RIVER DESERT SUCKER
L WHITE RIVER SPRINGFISH
M PAHRANAGAT ROUNDTAIL CHUB*
N PAHRUMP KILLIFISH*
O MOAPA DACE*
P LAHONTAN CUTTHROAT TROUT*
R VIRGIN SPINEDACE
S VIRGIN RIVER ROUNDTAIL CHUB
T WOUNDFIN*
Q LEAST CHUB

* Federally protected

RECOMMENDED PROTECTED FISH SPECIES FOR NEVADA AND UTAH

1 PRESTON WHITE RIVER SPRINGFISH
2 MORMON WHITE RIVER SPRINGFISH
3 WHITE RIVER SPRINGFISH
3a HIKO WHITE RIVER SPRINGFISH
3b MOAPA WHITE RIVER SPRINGFISH
4 ASH MEADOWS SPECKLED DACE
5 INDEPENDENCE VALLEY SPECKLED DACE
6 CLOVER VALLEY SPECKLED DACE
7 MOAPA SPECKLED DACE
8 NEWARK VALLEY TUI CHUB
9 LAHONTAN TUI CHUB
10 ALVORD CHUB
11 INDEPENDENCE VALLEY CHUB
12 SHELDON TUI CHUB
13 FISH CREEK SPRINGS TUI CHUB
14 JUNE SUCKER
16 UTAH LAKE SCULPIN
17 HUMBOLDT LAHONTAN CUTTHROAT TROUT
18 WHITE RIVER SPECKLED DACE
(F) UTAH OR SNAKE VALLEY CUTTHROAT TROUT
(R) VIRGIN SPINEDACE

RECOMMENDED PROTECTED INVERTEBRATES MOLLUSCS

19 OVERTON ASSIMINEA
20 MOAPA VALLEY TURBAN
21 ASH MEADOWS TURBAN
22 PAHRANAGAT VALLEY TURBAN
23 HOT CREEK TURBAN
24 STEPTOE TURBAN
25 WHITE RIVER VALLEY FONTELICELLA
26 RUBY VALLEY FONTELICELLA
27 CURRENT FONTELICELLA
28 DUCKWATER FONTELICELLA
29 RED ROCK FONTELICELLA
30 WHITE RIVER VALLEY HYDROBID
31 DUCKWATER SNAIL
32 CORN CREEK SNAIL
33 ASH MEADOWS TRYONIA
34 MOAPA TRYONIA
35 ZION CANYON PHYSA
36 RUSSELL'S SNAIL

INSECTS

DIPTERANS
37 VIRGIN RIVER NET WINGED MIDGE
HEMIPTERANS
38 ASH SPRINGS CREEPING WATER BUG
39 MOAPA CREEPING WATER BUG
PLECOPTERANS
40 GIANT STONEFLY NYMPH

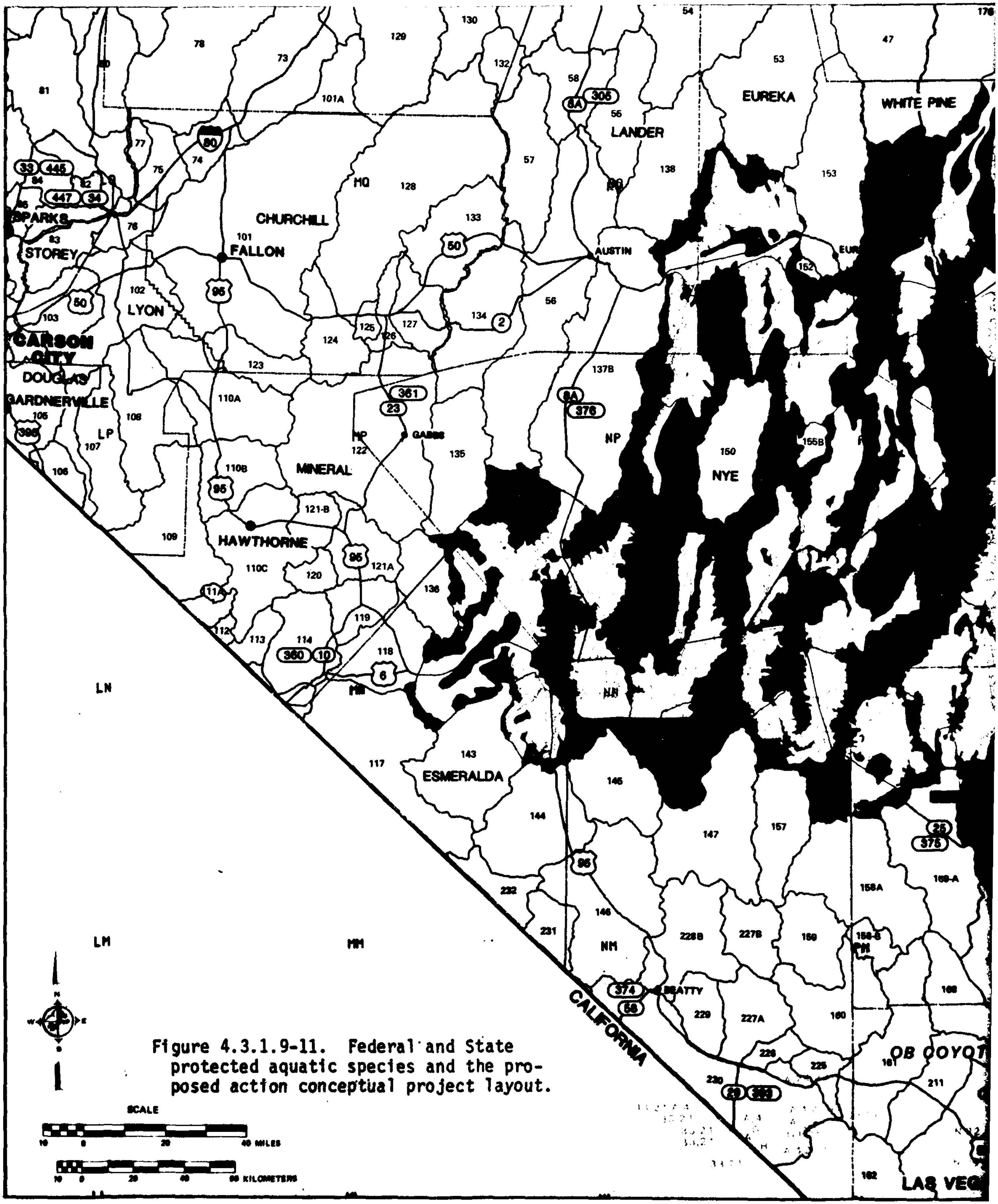
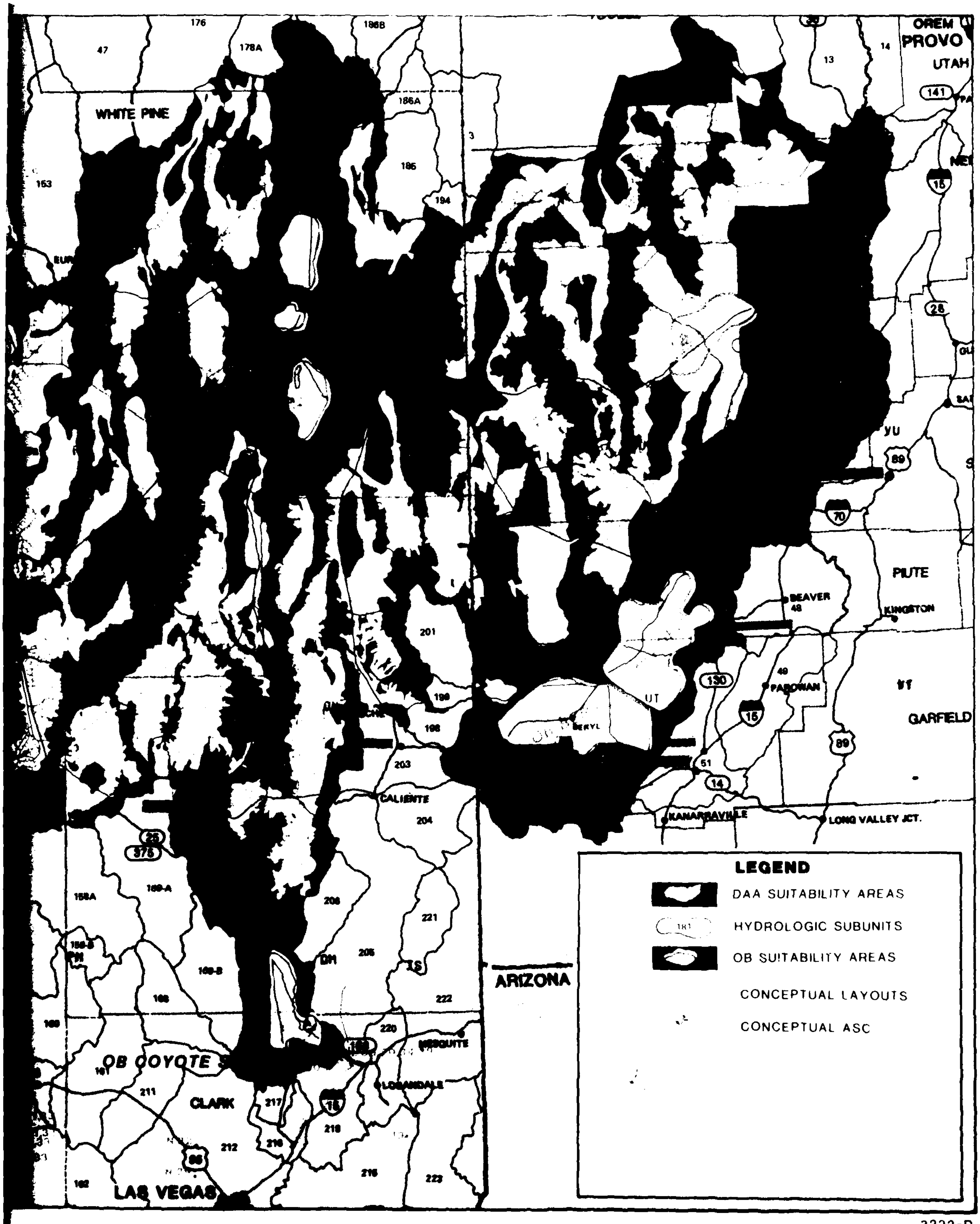


Figure 4.3.1.9-11. Federal and State protected aquatic species and the proposed action conceptual project layout.



LEGEND
DAA SUITABILITY AREAS
HYDROLOGIC SUBUNITS
OB SUITABILITY AREAS
CONCEPTUAL LAYOUTS
CONCEPTUAL ASC
WHITE PINE
OREM
PROVO
UTAH
PIUTE
BEAVER
KINGSTON
PAROWAN
GARFIELD
BERYL
CALIENTE
KANARRAVILLE
LONG VALLEY JCT.
ARIZONA
OB COYOTE S
CLARK
MESQUITE
LOGANDALE
LAS VEGAS

3222-D

A potential impact that appears to be most pervasive is that of groundwater withdrawal upon certain aquatic habitats that are hydrologically linked to aquifers depleted that would be used for M-X. Although there is substantial uncertainty associated with these impact predictions, the prospects for impact can be estimated based on known hydrological conditions and expected project requirements (Table 4.3.1.9-4). The most important area of potential impact occurs primarily in the White River Valley system, including White River, Pahranagat, Coyote Spring, and Moapa valley's in addition to feeder hydrologic subunits, including Dry Lake, Delamar, Pahroc, Coal, Garden, Long and Jakes valleys. Railroad, Hot Creek, Spring, Steptoe and Snake Valleys also contain numerous localized habitats with protected aquatic species which may be subject to either direct or indirect impacts of the Proposed Action. Federally and state protected fish occurring in Moapa and Pahranagat valleys (the most important being the Moapa dace and the Pahranagat roundtail chub) stand the greatest chance of being affected by groundwater withdrawal either as a result of water use directly in the valley of concern or in feeder valleys. (See Groundwater Resources, Section 4.3.1.1.)

Since the greatest percentage of groundwater withdrawal will occur in valleys removed from White River, Moapa, and Pahranagat valley, impacts may occur after water withdrawal takes place. This depends upon various hydrological features, such as substrate transmissivity, slope and fault structure. Water withdrawal impacts on springs in Moapa, Pahranagat, and White River valleys will probably occur on the order of months or years after the initiation of the action. More detailed project requirement data are required before impacts can accurately be measured, but the potential for significant loss of downslope aquatic habitat is especially likely in Moapa, Pahranagat and White River valleys. Although the magnitude of this effect may be large, its duration is not expected to exceed the duration of the action causing the depletion of groundwater. Since the habitat requirements for the species of concern are also incompletely known, the magnitude of the biological impact cannot be predicted.

Current endangerment of federally protected species appears to have resulted, in some instances, from stresses such as water diversion for irrigation purposes or use of the water source by livestock. For instance, in the Ash Spring outflow in Pahranagat Valley, the federally protected Pahranagat roundtail chub has dwindled to less than 45 individuals. This has resulted primarily from loss of spawning and feeding habitat due to periodic reductions in water level by 50 percent for irrigation purposes. Irrigation diversion may have also caused the extirpation of the White River spinedace from Preston Big Spring in White River Valley and the virtual loss of the White River desert sucker from the same habitat. Neither the normal variation in population size of individual species, nor baseline conditions including seasonal fluctuations, are presently known. Present knowledge indicates that population numbers remain fairly constant in some habitats, but fluctuate widely in others; a case-by-case evaluation of baseline conditions and potential project impacts would be required to answer these questions.

Reduction in population does not necessarily spell extinction if a nucleus of the population is retained and density dependent compensation is allowed to proceed along its course of rebuilding the carrying capacity of each unique habitat. Most aquatic species of concern produce at least one new generation per year and thus recovery would be fairly rapid if the impact were sufficiently mitigated and temporary, and if subsequent conditions permitted recovery. However, once a

Table 4.3.1.9-4. Protected or recommended protected aquatic biota for which available data indicate close monitoring for water withdrawal-related impacts during construction or operation of the project in Nevada/Utah.

POTENTIALLY IMPACTED PROTECTED OR RECOMMENDED PROTECTED BIOTA[1]	LEGAL STATUS[2]	SPECIES LOCATION[3]	ESTIMATED WATER USE (PERCENT OF PERENNIAL YIELD)[4]	INTERBASIN EXCHANGE - INPUT[5]			
				ADJACENT BASIN	ESTIMATED WATER USE PROJECT (PERCENT OF PERENNIAL YIELD)	NEARBY BASIN	ESTIMATED WATER USE PROJECT (PERCENT OF PERENNIAL YIELD)
Moapa dace	FE	Moapa	N/A	Coyote/Kane	27-163[6]/ 20-120[7]	Dry Lake	>73
Moapa White River springfish	ST	Moapa				Delamar	>20
Moapa speckled dace	RT	Moapa				Coal	>1,000
Moapa Valley turban	RT	Moapa				Garden	23-70
Moapa tryonia	RT/RE	Moapa				Cave	>50
Moapa creeping waterbug	RT/RE	Moapa				Jakes	>5.8
						Long	27-80
Pahranagat roundtail chub	RE	Pahranagat	1.6	Coal	>1,000	Garden	23-70
White River springfish	ST/RE	Pahranagat		Dry Lake	>73	Cave	>50
Hiko White River springfish	ST	Pahranagat		Delamar	>20	Jakes	>5.8
White River speckled dace	RT/RE	Pahranagat				Long	27-80
Pahranagat Valley turban	RT	Pahranagat					
Mormon White River springfish	ST	White River	5.9	Jakes	>5.8	Long	27-80
Preston White River springfish	ST						
White River desert sucker	ST/RE	White River					
White River spinedace	ST/RE	White River					
Hot Creek turban	RE	White River					
White River Valley fontelicella	RE	White River					
White River Valley hybrobiid	RE	White River					
Railroad Valley springfish	ST	Hot Creek	43	No Known Interbasin Exchange			

1449-6

[1]Scientific names are listed in ETR-16.

[2]F = federal, E = endangered, S = state, T = threatened, R = recommended.

[3]Valley, watershed, or hydrologic unit.

[4]MPO/PY = Estimated water use as determined by most probable quantity (MPO) divided by perennial yield (PY) as expressed in percent, per information derived from Table 3.2.2.1-1.in Chapter 3.

[5]Information derived from Figure 6 in Eakins (1966).

[6]Assuming location of first OB in valley during operation.

[7]Assuming location of second OB in valley during operation.

N/A = Not Available.

species population is reduced to a critical point it can no longer rebuild and results in extinction of the species in that particular habitat.

With respect to groundwater withdrawal, direct avoidance of sensitive aquatic habitats is not possible since the vagaries of groundwater movement are not presently well understood. The most promising mitigation is to change well pumping rates and locations as soon as effects on aquatic habitats of concern are noted. However, since the natural groundwater flow recovery may be slow, additional mitigations may be required. This may involve supplemental augmentation of water supply in affected aquatic habitat by piping in additional supplies from distant wells. Such pumping may, however, complicate the groundwater drawdown picture in the area and actually increase negative impacts on the habitat of concern. In this case, the only remaining mitigation would be transplantation of the affected population to another aquatic habitat unaffected by project impacts. This procedure would be difficult because of the variable water quality and habitat conditions between isolated aquatic habitats near and distant from the affected aquatic habitat. The USFWS discourages transplantation.

Direct intersection of project structures with sensitive aquatic habitats is not expected to cause significant impacts on protected aquatic species (Table 4.3.1.9-5). Only in Railroad and/or Snake Valleys do proposed project structures approach within one mile of habitats containing protected aquatic species -- the state protected Railroad Valley springfish and least chub, respectively. Habitats of the Morman White River springfish, Pahranagat roundtail chub and White River springfish occur within 5 mi of the same portion of the proposed DDA. Indirect impacts may occur in several locations during DDA construction. As mentioned previously, habitat disturbance, altered rainfall runoff patterns and addition of pollutants may result from project construction in the immediate vicinity of sensitive aquatic habitats. However, since these impacts could be readily mitigated by avoidance or site-specific design, thus reducing the potential for significant impacts.

Of particular concern are some of the last known habitats of a pure strain of the federally protected Lahontan cutthroat trout located in the Reese River headwaters, and adjacent to some of the western-most cluster construction areas (Big Smoky Valley, etc.). Fishing pressure, enhanced by project-related personnel (e.g., from nearby construction camps) could produce significant losses unless mitigated. Populations of the state-protected Utah cutthroat trout occurring in the mountains bordering Spring and Snake valleys also would be subjected to increased fishing pressure. Special fishing restrictions may be required for these areas to protect this species. For other locations, most of the impacts can be mitigated first by avoidance, then by various site-specific mitigations initiated to protect the uniqueness and integrity of sensitive habitats. At this stage, however, neither these impacts nor mitigating measures can be accurately quantified.

A summary of the impacts for the Proposed Action is presented in Table 4.3.1.9-6. Moapa (Muddy River) and Pahrangat, Spring, White River valley and the Virgin River are subject to the most significant losses, although they are mitigatible. Groundwater withdrawal and indirect effects (recreation) cause most concern. Long-term impacts are moderate in two valleys only, and virtually non-existent in all others.

Table 4.3.1.9-5. Valleys containing both sensitive aquatic habitat and proposed structures (inhabited by either legally or recommended protected aquatic species).

HYDROLOGIC SUBLIMITS		SENSITIVE AQUATIC HABITATS		
		TOTAL	I*	PERCENT OF TOTAL
4	Snake	13	2+	15.4
5	Pine			
6	White	2	0+	0
7	Fish Springs	3	0	0
8	Dugway			
9	Government Creek			
46A	Sevier Desert - Dry Lake (UT)			
46				
52	Lund District (UT)			
54	Wah Wah (UT)			
137A	Big Smoky - Tonopah Flat	1	0	0
139	Kobeh			
140A	Monitor - Northern	2	0	0
141	Ralston			
142	Alkali Spring			
149	Stone Cabin			
150	Little Fish Lake			
151	Antelope			
154	Newark	11	0	0
155A	Little Smoky - Northern	1	1	100
155B	Little Smoky - Central			
155C	Little Smoky - Southern			
156	Hot Creek			
170	Penoyer			
171	Coal			
172	Garden			
173A	Railroad - Southern			
173B	Railroad - Northern	4	1	25
174	Jakes			
175	Long			
178B	Butte - South			
180	Cave			
181	Dry Lake			
182	Delamar			
183	Lake			
184	Spring	4	0	0
196	Hamlin			
202	Patterson			
207	White River	9	0+	0
208	Pahroc			
209	Pahranagat	5	0+	0
210	Coyote Springs			
53	Beryl			
148	Cactus flat			
179	Stentoe	14	0	0

3688-1

*I = intersection with aquatic habitats (within 1 mi)

+Some additonal habitats approached by project in structure within 5 mi.

Table 4.3.1.9-6. Potential direct impact to protected aquatic species in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC UNIT OR COUNTY		ABUNDANCE INDEX[2]	HIGHEST LEGAL STATUS[3]	SHORT-TERM EFFECT			LONG-TERM EFFECT		
				% HABITAT LOSS		DIRECT IMPACT[5]	% HABITAT LOSS		DIRECT IMPACT[5]
NO.	NAME			GROUND-WATER WITH-DRAWAL	OTHER DIRECT[4]		GROUND-WATER WITH-DRAWAL	OTHER DIRECT[4]	
	Subunits with M-X Clusters and DTN								
4	Snake	Moderate	SE	5	30	Low	5	20	Low
5	Pine	No	—	0	0	No	0	0	No
6	White	Moderate	ST	5	30	Low	5	20	Low
7	Fish Springs	Moderate	ST	5	10	Low	5	10	Low
8	Dugway	No	—	0	0	No	0	0	No
9	Government Creek	No	—	0	0	No	0	0	No
46	Sevier Desert	No	—	0	0	No	0	0	No
46A	Sevier Desert & Dry Lake[2]	No	—	0	0	No	0	0	No
54	Wah Wah	No	—	0	0	No	0	0	No
137A	Big Smoky-Tonopah Flat	No	—	0	0	No	0	0	No
139	Kobeh	No	—	0	0	No	0	0	No
140A	Monitor—Northern	No	—	0	0	No	0	0	No
140B	Monitor—Southern	No	—	0	0	No	0	0	No
141	Ralston	No	—	0	0	No	0	0	No
142	Alkali Spring	No	—	0	0	No	0	0	No
148	Cactus Flat	No	—	0	0	No	0	0	No
149	Stone Cabin[2]	No	—	0	0	No	0	0	No
151	Antelope	No	—	0	0	No	0	0	No
154	Newark[2]	Low	RT	10	10	Low	10	5	Low
155A	Little Smoky—Northern	No	—	0	0	No	0	0	No
155C	Little Smoky—Southern	No	—	0	0	No	0	0	No
156	Hot Creek	Low	ST	30	5	Low	5	0	Low
170	Penoyer	No	—	0	0	No	0	0	No
171	Coal	No	—	0	0	No	0	0	No
172	Garden	No	—	0	0	No	0	0	No
173A	Railroad—Southern	Moderate	RE	10	40	Moderate	10	15	Low
173B	Railroad—Northern	Moderate	RE	10	40	Moderate	10	15	Low
174	Jakes	No	—	0	0	No	0	0	No
175	Long	No	—	0	0	No	0	0	No
178B	Butte—South	Low	ST	5	0	Low	5	0	Low
179	Steptoe	Moderate	SE	5	0	Low	5	5	Low
180	Cave	No	—	0	0	No	0	0	No
181	Dry Lake[2]	No	—	0	0	No	0	0	No
182	Delamar	No	—	0	0	No	0	0	No
183	Lake	No	—	0	0	No	0	0	No
184	Spring	High	FE	5	5	Moderate	0	0	Low
196	Hamlin	No	—	0	0	No	0	0	No
202	Patterson	No	—	0	0	No	0	0	No
207	White River	High	RE	5	30	Low	5	5	Low
208	Pahroc	No	—	0	0	No	0	0	No
209	Pahranagat	High	FE	30	10	Moderate	10	5	Moderate
	Other Affected Subunits								
56	Upper Reese River	Moderate	FT	0	0	Low	0	0	Low
176	Ruby	Moderate	ST	0	0	Low	0	0	Low
187	Goshute	Moderate	ST	0	0	Low	0	0	Low
205	Meadow Wash	Low	RE	0	5	Low	0	5	Low
219	Muddy River Springs	High	FE	40	20	High	20	0	Moderate
222	Virgin River	High	FE	0	0	Low	0	0	Low
	Overall DDA Impact			7	10	Low	4	4	Low

3931-2

No impact. (No protected aquatic species for abundance index.)

Low impact. (Low resource for abundance index.)

Moderate impact. (Moderate resource for abundance index.)

High impact. (High resource for abundance index.)

Conceptual location of Area Support Center (ASC).

Protection Status: FE = Federal Endangered, FT = Federal Threatened, SE = State Endangered, ST = State Threatened, RE = Recommended Endangered, RT = Recommended Threatened.

Construction activity, altered rainwater runoff patterns, addition of pollutants.

Coyote Spring Valley OB Impacts

The impacts of locating an OB in Coyote Spring Valley (Figure 4.3.1.9-12) increases the general project layout impacts resulting from groundwater withdrawals. The boundary of the OB suitability envelope approaches as close as 1-2 mi from the Moapa Fish Sanctuary. Locating an OB at Coyote Spring (Table 4.3.1.9-7) may reduce the perennial yield for this hydrologic subunit such that when added to effects of groundwater withdrawal in connecting feeder valleys upslope from the Moapa Fish Sanctuary, the chance for preventing irretrievable losses of the protected aquatic species in the Moapa Fish Sanctuary is high. Pumping of water allotted to Las Vegas from Lake Mead would effectively mitigate concern of water withdrawal impacts of the OB upon the Moapa Fish Sanctuary.

Federally and state protected fish will also be impacted by DTN construction and support community growth in the portion of the Pahranagat Valley near Alamo. The impacts of road construction and project-related personnel recreation on the habitats in Pahranagat Valley are not expected to be significant but if added to pre-existing stresses such as irrigation diversion, livestock watering, proliferation of exotic species and swimming, a significant reduction of the resource could result. This would be in addition to impacts resulting from project related reductions in spring flow. Federally and state protected species occur both in the Virgin River, 30 mi to the east of the proposed OB location in Coyote Spring Valley and in certain habitats located approximately at an equal distance to the west. Impacts may be expected in the Virgin River but not in habitats west of Las Vegas. Water withdrawal and recreation will not directly impinge upon these latter habitats for the following reasons: the groundwater hydrology is such that project-related well water withdrawals would not affect them, and the recreational pressures would most likely be diverted to locations adjacent to the Coyote Spring site such as Lake Mead, the Virgin River and Las Vegas.

Milford OB Impacts

Since no federally or state protected fish occur within at least a 40-mi radius of the proposed Milford OB, it is postulated that no significant direct or indirect effects of construction or operation of this facility will impact protected aquatic species.

ALTERNATIVE 1 (4.3.1.9.4.3)

DDA Impacts

The impacts for the DDA of this alternative would be identical to those for the Proposed Action.

Coyote Spring Valley OB Impacts

Potential impacts are the same as for the Proposed Action (Table 4.3.1.9-7).

Beryl OB Impacts

No federally or state protected aquatic species are known to occur at less than a 40 mi radius from the proposed Beryl OB and thus no additional significant impacts are expected.

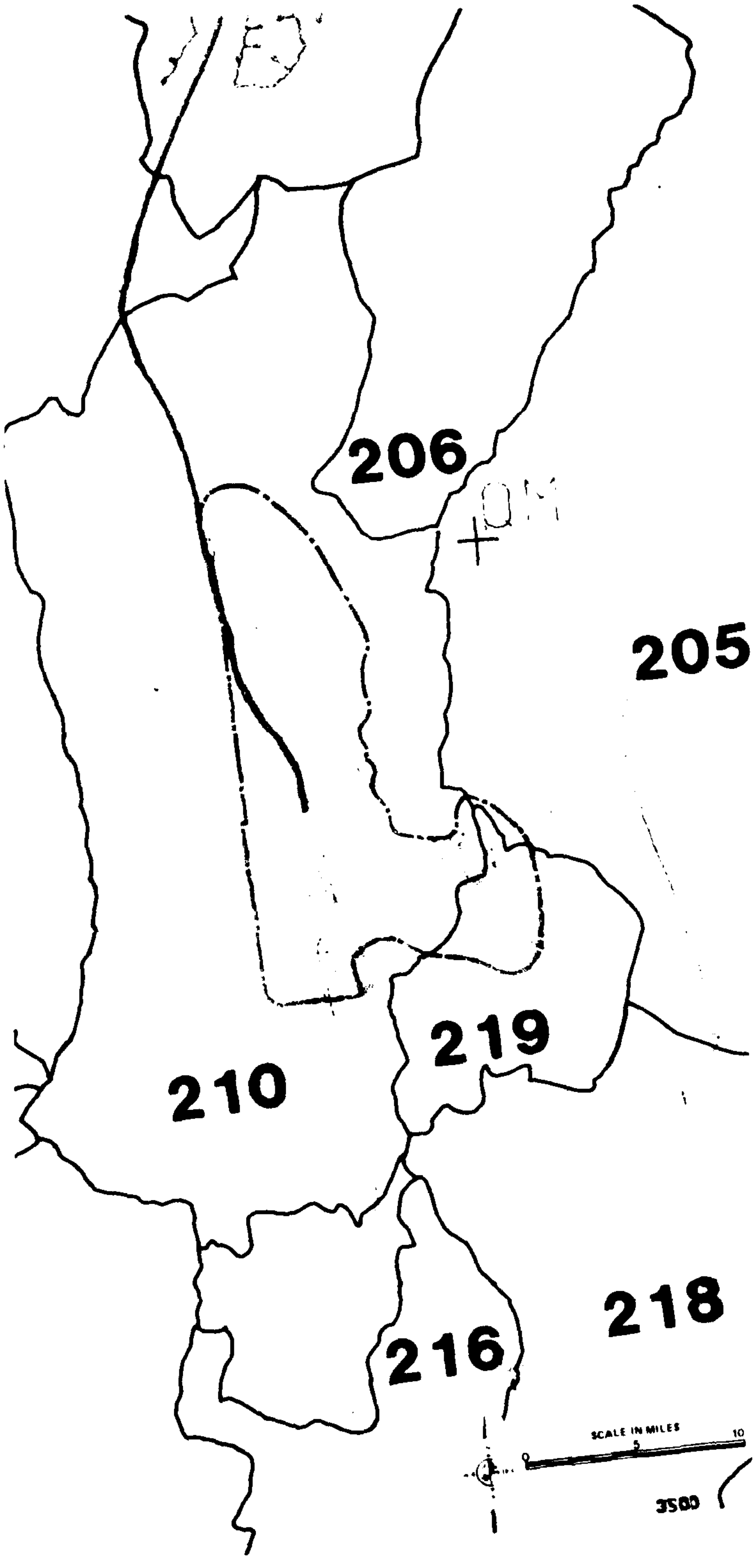


Figure 4.3.1.9-12. Federally and state-protected fish in the Coyote Spring OB vicinity.

Table 4.3.1.9-7. Potential impact to protected aquatic species which could result from construction and operation of M-X operating bases for the Proposed Action and Alternatives 1-8 (page 1 of 3).

HYDROLOGIC SUBUNIT OR COUNTY NO.	HYDROLOGIC SUBUNIT OR COUNTY NAME	ABUNDANCE INDEX[1]	HIGHEST LEGAL STATUS[3]	ESTIMATED INDIRECT IMPACT[4]: PROPOSED ACTION COYOTE SPRING/ MILFORD	ALT. 1 COYOTE SPRING/ BERYL	ALT. 2 COYOTE SPRING/ DELTA
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert	No	—			No
46A	Sevier Desert & Dry Lake[2]	No	—			No
50	Milford[2]	No	—	No		
52	Lund District	No	—	No	No	
53	Beryl-Enterprise	No	—		No	
179	Steptoe	Moderate	SE	Moderate	Moderate	Moderate
210	Coyote Spring	No	—	No	No	No
219	Muddy River Springs	High	FE	High	High	High
	Curry County, NM	—				
	Hartley County, TX[5]	—				
	Other Affected Subunits or Counties					
4	Snake	Moderate	SE	Moderate	Moderate	Moderate
6	White	Moderate	ST	Moderate	Moderate	Moderate
7	Fish Springs	Moderate	ST	Moderate	Low	Moderate
56	Upper Reese River	Moderate	FT	Moderate	Moderate	Moderate
154	Newark	Low	RT	Low	Low	Low
156	Hot Creek	Low	ST	Low	Low	Low
173	Railroad	Moderate	RE	Moderate	Moderate	Moderate
176	Ruby	Moderate	ST	Moderate	Moderate	Moderate
178B	Butte—South	Low	ST	Low	Low	Low
184	Spring	High	FE	High	High	High
187	Goshute	Moderate	ST	Low	Low	Low
205	Meadow Wash	Low	RE	Moderate	Moderate	Moderate
207	White River[2]	High	RE	High	High	High
209	Pahranagat	High	FE	High	High	High
222	Virgin River	High	FE	High	High	High
	Overall Alternative Impact			Moderate	Moderate	Moderate

3932-3

[1,4]
- No impact. (No protected aquatic species for Abundance Index.)
- Low impact. (Low resource for Abundance Index.)
- Moderate impact. (Moderate resource for Abundance Index.)
- High impact. (High resource for Abundance Index.)

[2]Conceptual location of Area Support Center (ASC) for Proposed Action and Alternatives 1-6.

[3]Protection Status: FE = federal endangered; FT = federal threatened; SE = state endangered; ST - state threatened; RE = recommended endangered; RT = recommended threatened.

[5]Conceptual location of Area Support Center (ASC) for Alternative 7.

Table 4.3.1.9-7. Potential impact to protected aquatic species which could result from construction and operation of M-X operating bases for the Proposed Action and Alternatives 1-8 (page 2 of 3).

HYDROLOGIC SUBUNIT OR COUNTY NO.	HYDROLOGIC SUBUNIT OR COUNTY NAME	ABUNDANCE INDEX[1]	HIGHEST LEGAL STATUS[3]	ESTIMATED INDIRECT IMPACT[4] ALT. 3 BERYL/ ELY	ALT. 4 BERYL/ COYOTE SPRING	ALT. 5 MILFORD/ ELY
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert	No	—			
46A	Sevier Desert & Dry Lake[2]	No	—			
50	Milford[2]	No	—			No
52	Lund District	No	—	No	No	No
53	Beryl-Enterprise	No	—	No	No	No
179	Steptoe	Moderate	SE	Moderate		Moderate
210	Coyote Spring		—			
219	Muddy River Springs	High	FE	High	High	Moderate
	Curry County, NM[5]	—				
	Hartley County, TX[5]	—				
	Other Affected Subunits or Counties					
4	Snake	Moderate	SE	Moderate	Moderate	Moderate
6	White	Moderate	ST	Moderate	Moderate	Moderate
7	Fish Springs	Moderate	ST	Moderate	Moderate	Moderate
56	Upper Reese River	Moderate	FT	High	Moderate	High
154	Newark[2]	Low	RT	Low	Low	Low
156	Hot Creek	Low	ST	Low	Low	Low
173	Railroad	Moderate	RE	Moderate	Moderate	Moderate
176	Ruby	Moderate	ST	Moderate	Moderate	Moderate
178B	Butte—South	Low	ST	Low	Low	Low
184	Spring	High	FE	High	High	Low
187	Goshute	Moderate	ST	Moderate	Low	Moderate
205	Meadow Wash	Low	RE	Moderate	Moderate	Moderate
207	White River[2]	High	RE	High	High	High
209	Pahranagat	High	FE	High	High	High
222	Virgin River	High	FE	High	High	High
	Overall Alternative Impact			Moderate	Moderate	Moderate

3932-3

[1,4] No impact. (No protected aquatic species for Abundance Index.)
Low impact. (Low resource for Abundance Index.)
Moderate impact. (Moderate resource for Abundance Index.)
High impact. (High resource for Abundance Index.)

[2]Conceptual location of Area Support Center (ASC) for Proposed Action and Alternatives 1-6.

[3]Protection Status: FE = federal endangered; FT = federal threatened; SE = state endangered; ST - state threatened; RE = recommended endangered; RT = recommended threatened.

[5]Conceptual location of Area Support Center (ASC) for Alternative 7.

Table 4.3.1.9-7. Potential impact to protected aquatic species which could result from construction and operation of M-X operating bases for the Proposed Action and Alternatives 1-8 (page 3 of 3).

HYDROLOGIC SUBUNIT OR COUNTY NO.	HYDROLOGIC SUBUNIT OR COUNTY NAME	ABUNDANCE INDEX[1]	HIGHEST LEGAL STATUS[3]	ESTIMATED INDIRECT IMPACT[4] ALT. 6 MILFORD/ COYOTE SPRING	ALT. 7 CLOVIS/ DALHART	ALT. 8 COYOTE SPRING/ CLOVIS
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert	No impact	—			
46A	Sevier Desert & Dry Lake[2]	No impact	—			
50	Milford[2]	No impact	—	No impact		
52	Lund District	No impact	—	No impact		
53	Beryl-Enterprise	No impact	—			
179	Steptoe	Moderate	SE	Low impact		Moderate
213	Coyote Spring	No impact	—	No impact		No impact
219	Muddy River Springs	High	FE	High		High
	Curry County, NM[5]	—			No impact	
	Hartley County, TX[5]	—			No impact	
	Other Affected Subunits or Counties					
4	Snake	Moderate	SE	Moderate		Moderate
6	White	Moderate	ST	Moderate		Moderate
7	Fish Springs	Moderate	ST	Moderate		Low impact
56	Upper Reese River	Moderate	FT	Moderate		Moderate
154	Newark[2]	Low impact	RT	Low impact		Low impact
156	Hot Creek	Low impact	ST	Low impact		Low impact
173	Railroad	Moderate	RE	Moderate		Moderate
176	Ruby	Moderate	ST	Low impact		Moderate
178B	Butte—South	Low impact	ST	Low impact		Low impact
184	Spring	High	FE	High		High
187	Goshute	Moderate	ST	Low impact		Low impact
205	Meadow Wash	Low impact	RE	Moderate		Moderate
207	White River[2]	High	RE	High		High
209	Pahranagat	High	FE	High		High
222	Virgin River	High	FE	High		High
	Overall Alternative Impact			Moderate	No impact	Moderate

3932-3

[1,4] No impact. (No protected aquatic species for Abundance Index.)

Low impact. (Low resource for Abundance Index.)

Moderate impact. (Moderate resource for Abundance Index.)

High impact. (High resource for Abundance Index.)

[2]Conceptual location of Area Support Center (ASC) for Proposed Action and Alternatives 1-6.

[3]Protection Status: FE = federal endangered; FT = federal threatened; SE = state endangered. ST - state threatened; RE = recommended endangered; RT = recommended threatened.

[5]Conceptual location of Area Support Center (ASC) for Alternative 7.

ALTERNATIVE 2 (4.3.1.9.4.4)

DDA Impacts

The impacts of the DDA would be identical to those for the Proposed Action.

Coyote Spring Valley OB Impacts

Impacts of the Coyote Spring Valley OB would be the same as discussed for the Proposed Action.

Delta OB Impacts

The potential impacts of the OB located near Delta are shown in Table 4.3.1.9-7. The nearest relevant aquatic biological resource is the historical occurrence of the state protected least chub in Coyote and Tule Springs, located about 35 mi to the west. No direct effects of water withdrawal from construction at this site would be expected on these least chub habitats since they occur one valley distant and perpendicular to the direction of groundwater flow. The greatest potential impact resulting from a base at Delta is expected to be related to recreation by persons either directly or indirectly associated with the project (Table 4.3.1.9-7). Peak recreational activities would occur during the end of the construction period (short-term) and into the operational (long-term) period. Recreational impacts, however, are expected to be moderate, but not significant, since swimming, picnicking, and/or fishing in these areas would be most likely low priority in preference for more desirable and scenic mountainous areas to the west and east, primarily the Snake and Wasatch Ranges, respectively.

ALTERNATIVE 3 (4.3.1.9.4.5)

DDA Impacts

Impacts of the DDA are identical to those presented for the Proposed Action.

Beryl OB Impacts

Impacts to protected aquatic species in the vicinity of the Beryl OB are the same as discussed for Alternative 1.

Ely OB Impacts

The Ely OB would be situated in a valley containing state protected aquatic species and subject to cumulative effects from other existing and proposed projects unrelated to M-X (Kennecott Copper Mine and White Pine Power Project). In Steptoe Valley (Figure 4.3.1.9-13) occur the state protected relict dace and Utah cutthroat trout. A transplanted population of the federally protected Pahrump killifish resides in Spring valley approximately 40 mi southeast of Ely while several state protected species occur in White River valley 25 mi or farther to the southwest.

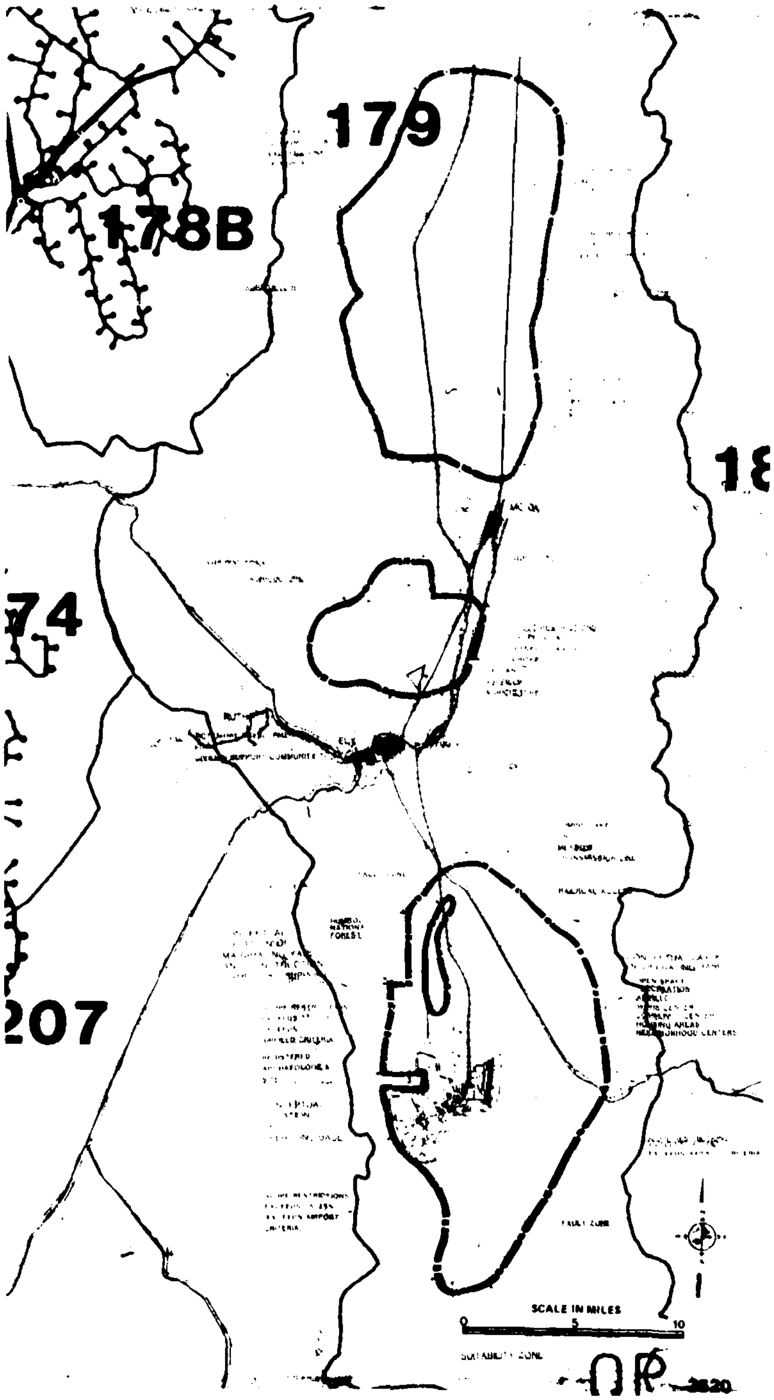


Figure 4.3.1.9-13. Protected aquatic species in the Ely OB vicinity.

Water withdrawal impacts as a result of the Ely OB are likely to be localized, affecting only small portions of Steptoe Valley, since the ratio of water available to that which is needed by the project is large (4 to 1). Only one population of the relict dace occurs near enough to the proposed OB location to be considered subject to a threat of habitat loss from groundwater withdrawal. However, if the M-X OB were in Ely and the proposed White Pine Power Project were constructed in Steptoe or White River valleys, the potential for major cumulative effects of groundwater withdrawal are possible on at the least the southern portions of the Steptoe Valley relict dace populations (e.g. at Grass, Spring, Steptoe Ranch Spring, and Steptoe Creek).

Of more importance is the single population of pure strain Utah cutthroat trout located in the northern portion of the valley in Goshute Creek, approximately 60 mi north of the proposed OB location. It is expected that increased fishing pressure, as a result of not only the M-X project, but also the White Pine Power Project could significantly impact the occurrence of this cutthroat trout. One mitigating measure could be setting aside Goshute Creek as a preserve for the Utah cutthroat trout and not allowing or greatly limiting fishing. Potential recreational effects on adjoining valleys such as Spring and White River Valley are expected to be moderate. Measures to protect critically sensitive habitats, such as those at Shoshone Ponds and Preston or Lund Town Springs could involve fencing of the aquatic habitats in order to limit swimming or habitat disturbance that tend to reduce the viability of the resident populations. One Shoshone Pond containing the Pahrump killifish is already fenced and this should be sufficient to continue protecting the existing populations. Another pond adjacent to this habitat which also contains the Pahrump killifish may need to be fenced. Peak recreational pressure should occur toward the end of the construction period, and for the duration of the operational period of the OB. Recreational impacts to the other protected species are not likely to be significant either because of the unattractiveness of their habitats for recreational pursuits or because they are too remote or already protected from existing recreational pressure. A summary of the Ely OB Alternative 3 related impacts are summarized in Table 4.3.1.9-7.

ALTERNATIVE 4 (4.3.1.9.4.6)

DDA Impacts

Impacts of DDA construction and operation would be the same as described for the Proposed Action.

Coyote Spring Valley OB Impacts

Impacts of the OB at Coyote Spring would Valley be similar to those described for the Proposed Action. The DTN would not be in Pahranagat Valley, however, and the OBTS would be at the Beryl OB. Thus, impacts to protected aquatic species in Pahranagat Valley will be alleviated with respect to DTN construction. Impacts of groundwater withdrawal upon the downslope Moapa Fish Sanctuary are expected to slightly decrease because of the reduced water needs at Coyote Spring for this Alternative. However, impacts to the protected fish at Moapa are still expected to be significant and possibly irretrievable, unless water is piped in from Las Vegas.

ALTERNATIVE 5 (4.3.1.9.4.7)

DDA Impacts

The impacts for this alternative are identical to those for the Proposed Action.

Milford OB Impacts

Imapcts would be the same as described for the Proposed Action.

Ely OB Impacts

Impacts would be the same as described for Alternative 3.

ALTERNATIVE 6 (4.3.1.9.4.8)

DDA Impacts

The impacts for this alternative are identical to those for the Proposed Action.

Milford OB Impacts

Impacts would be the same as discussed for the Proposed Action.

Coyote Spring Valley OB Impacts

Impacts would be the same as described for Alternative 4.

ALTERNATIVE 7 (4.3.1.9.4.9)

DDA Impacts

No significant impacts are expected for the Texas/New Mexico full basing alternative since water depletion and other direct project impacts are not expected to occur at sensitive aquatic habitats. Recreational impacts are more difficult to predict, but are not estimated to be significant because of the lure of more aesthetically attractive locations, instead of those containing protected species, such as the federally listed Pecos gambusia.

Clovis OB Impacts

No state or federally protected fish occur in the immediate vicinity of the proposed Clovis OB suitability zone, and no direct or indirect impacts are predicted.

Dalhart OB Impacts

No state of federally protected fish occur in or near the Dalhart OB suitability zone, and thus, no impacts are predicted.

ALTERNATIVE 8 (4.3.1.9.4.10)

DDA Impacts

In Nevada/Utah, impacts resulting from this split basing alternative will be decreased from those predicted for full deployment in the Nevada/Utah study area as discussed in the Proposed Action section. Direct impacts of cluster construction will occur in White River Valley upon the habitats of one or two state protected fish, but they are not expected to be significant since these fish occur elsewhere and impacts will be mitigatable. Groundwater withdrawal effects are not expected to be as large as predicted for previous alternatives since feeder valleys of the White River system will not be so heavily utilized for their water yield as with full deployment in the same area. Recreational effects of the project will occur but in fewer hydrologic subunits than for full development. Effects of recreation upon the federally protected Lahontan cutthroat trout are expected to be alleviated as a result of elimination of cluster construction in valleys adjoining the nearest location of this fish (e.g., Big Smoky Valley and vicinity). Direct impacts in Nevada/Utah are summarized in Table 4.3.1.9-8.

No significant impacts are expected for the Texas/New Mexico portion of this alternative for reasons discussed in under Alternative 7.

Coyote Spring Valley OB Impacts

Impacts to protected aquatic species would be the same as discussed for the Proposed Action.

Clovis OB Impacts

Impacts would be the same as discussed in Alternative 7.

Table 4.3.1.9-8. Potential direct impact to protected aquatic species in Nevada/Utah and Texas/New Mexico[1] DDA for Alternative 8.

HYDROLOGIC UNIT OR COUNTY		ABUNDANCE INDEX[2]	HIGHEST LEGAL STATUS[3]	SHORT-TERM EFFECT			LONG-TERM EFFECT		
				% HABITAT LOSS		DIRECT IMPACT[5]	% HABITAT LOSS		DIRECT IMPACT[5]
NO.	NAME			GROUND-WATER WITH-DRAWAL	OTHER DIRECT[4]		GROUND-WATER WITH-DRAWAL	OTHER DIRECT[4]	
	Subunits or Counties with M-X Clusters and DTN								
4	Snake	Moderate	SE	5	20	Low	5	10	Low
5	Pine	None	—	0	0	None	0	0	None
6	White	Moderate	ST	0	0	Low	0	0	Low
7	Fish Springs	Moderate	ST	5	5	Low	0	0	Low
46	Sevier Desert	None	—	0	0	None	0	0	None
46A	Sevier Desert & Dry Lake[6]	None	—	0	0	None	0	0	None
54	Wah Wah	None	—	0	0	None	0	0	None
155C	Little Smoky—Southern	None	—	0	0	None	0	0	None
156	Hot Creek	Low	ST	30	5	Low	5	0	None
170	Penover	None	—	0	0	None	0	0	None
171	Coal	None	—	0	0	None	0	0	None
172	Garden	None	—	0	0	None	0	0	None
173A	Railroad—Southern	Moderate	RE	0	0	Low	0	0	Low
173B	Railroad—Northern	Moderate	RE	0	0	Low	0	0	Low
180	Cave	None	—	0	0	None	0	0	None
181	Dry Lake[6]	None	—	0	0	None	0	0	None
182	Delamar	None	—	0	0	None	0	0	None
183	Lake	None	—	0	0	None	0	0	None
184	Spring	High	FE	5	5	Moderate	0	0	Low
196	Hamlin	None	—	0	0	None	0	0	None
202	Patterson	None	—	0	0	None	0	0	None
207	White River	High	RE	5	30	Moderate	5	5	Low
	Other Affected Subunits								
56	Upper Reese River	Moderate	FT	0	0	Low	0	0	Low
154	Newark	Low	RT	0	0	Low	0	0	Low
176	Ruby	Moderate	ST	0	0	Low	0	0	Low
178B	Butte—South	Low	ST	0	0	Low	0	0	Low
179	Steptoe	Moderate	SE	0	0	Low	0	0	Low
187	Goshute	Moderate	ST	0	0	Low	0	0	Low
205	Meadow Wash	Low	RE	0	5	Low	0	5	Low
209	Pahranagat	High	FE	2	0	Moderate	10	5	Moderate
222	Virgin River	High	FE	0	0	Low	0	0	Low
	Overall DDA Impact			5	5	Low	2	1	Low

3933-2

[1]There are no known protected aquatic species that would be affected as a result of M-X deployment in Texas/New Mexico.

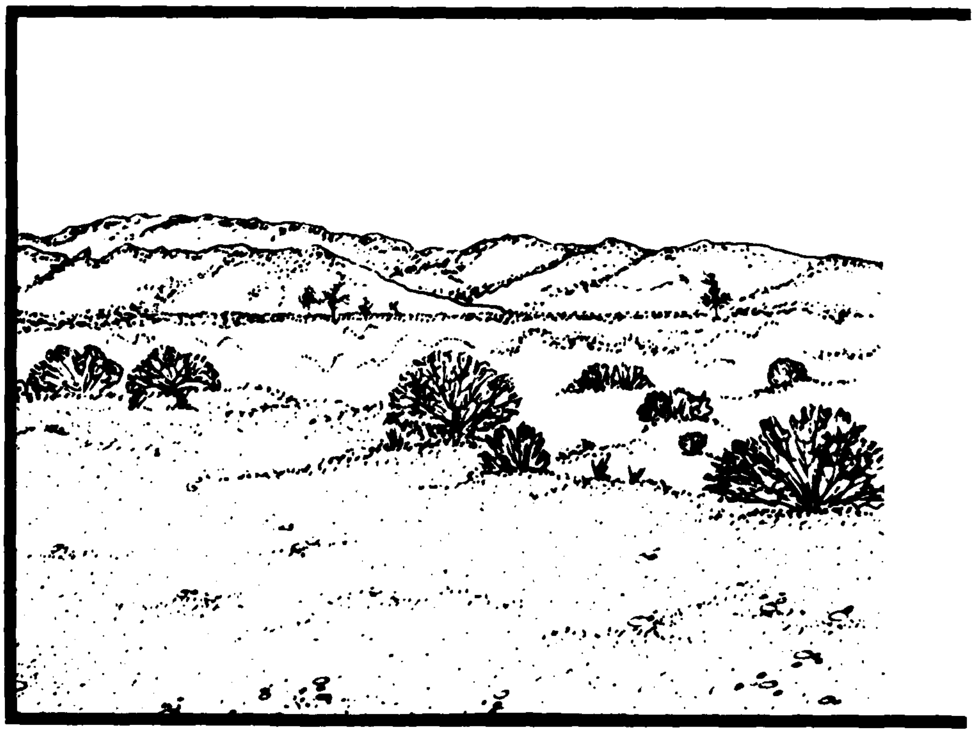
[2,5]
- None: No impact. (No protected aquatic species for abundance index.)
- Low: Low impact. (Low resource for abundance index.)
- Moderate: Moderate impact. (Moderate resource for abundance index.)
- High: High impact. (High resource for abundance index.)

[3]Protection status. FE = Federal Endangered; FT = Federal Threatened; SE = State Endangered; ST = State Threatened, RE = Recommended Endangered, RT = Recommended Threatened.

[4]Construction activity, altered rainwater runoff patterns, addition of pollutants.

[6]Conceptual location of Area Support Center (ASC).

Wilderness Areas



WILDERNESS

INTRODUCTION (4.3.1.10.1)

Impact analysis was performed in three steps: (1) a description of project effects on potential wilderness (i.e., wilderness study areas on WSAs), (2) an assessment of the impact to WSAs, and (3) a determination of impact significance. M-X effects on WSAs were estimated by combining baseline information with project information. These effects would result primarily from general construction activities and recreation of project-related or induced population growth.

Hydrologic subunits were ranked on a scale of high to low potential for impact according to (1) the potential noise and visual effects resulting from construction activities, and (2) potential for increased visitation as measured by proximity to existing paved roads.

Project-related wilderness users are anticipated primarily to originate from OB population centers. A population-related indirect effect index from OB impact analysis was developed using linear distance from the population center and the attractiveness of a particular site. The population of each operating base produces a human-related, indirect use effect on each wilderness which decays in a Gaussian exponential fashion similar to a gravity model, as the distance from the base increases. The model produces an index of effects which can be used for ordinal ranking of the different potential base sites and, when the areas under the normal curves for two bases of an alternative are added, for ranking of the different potential base sites and, when the areas under the normal curves for two bases of an alternative are added, and for ranking the relative effects of each alternative. The effect index is not a prediction of the actual level of impact on any one resource, but rather an index to which a measured impact could be correlated. The impacts are assumed to be normally distributed from the base with 2/3 of the effects of the OB site be within a 35 mi radius, and 95 percent of the OB effects within 70 mi of the operating base.

PROPOSED ACTION (4.3.1.10.2)

DDA Impacts

The primary sources of project-related DDA impacts to the wilderness resource include (1) valley floor scarification by cluster and road networks and the

resultant alteration of scenic landscapes visible from montane vista points, (2) enhanced noise levels and changes in air quality during construction activites, and (3) increased access to formerly remote areas, and (4) increased number of people both during construction and operation. (Figure 4.3.1.10-1 illustrates the relationship between wilderness and the project). Short-term effects of M-X deployment on wilderness would include those associated with the construction activities--changes in noise and air quality levels.

In those WSAs near project features, wilderness qualities of naturalness and solitude will be degraded. In an open valley, construction traffic and road sounds could be heard up to six miles away. While siting clusters and road networks adjacent to prospective wilderness increases access to, and hence opportunities for, enjoyment of wilderness, it would also reduce the unimpaired primitive/natural qualities associated with wildlands. Once construction is completed, the presence of protective structures, DTN, and cluster road networks will permanently alter some scenic vistas from nearby potential wilderness areas.

Population-related effects on the quality of the wilderness experience will be proportional to user density. In the short-term these will be primarily a function of population centers associated with construction residence areas, while in the long-term such effects will be those assocated with OBs. Effects levels would also be related to the ability and propensity of each population group to use wilderness resources. Construction personnel, particularly those on large projects like M-X tend to work extended overtime and thus to have relatively less free time for recreation. Operations personnel and people and dependents moving to the area due to increased economic activity have relatively more free time. Thus while more people may be present during construction, impacts on recreation areas including wilderness areas are expected to be greater during operation. The effects related to operating bases (discussed below) are also of more importance because of their permanence.

An estimate of the potential "short-term" population-related effects are most likely in 12 of the 41 hydrologic subunits: Pine, Sevier Desert, Wah Wah, Big Smoky-Tonopah Flat, Kobeh, Stone Cabin, Antelope, Penoyer, Coal, Butte, Spring and Hamlin (Table 4.3.1.10-1). The analysis for "short-term" people-related effects is only a first approximation and presumed use is primarily in wilderness adjacent to the hydrologic subunit under consideration. The analysis does not take site attractiveness into account.

M-X construction in eight of the 41 hydrologic su[illegible]ts [illegible]ld be expected to produce significant but short-term visual and noise impa[illegible] [illegible]cent WSAs (Table 4.3.1.10-1). Audible evidence of project action will affect roughly two-thirds of the total potential wilderness in the Great Basin study area. It is estimated that M-X construction in those hydrologic subunits with several wilderness areas will result in a greater potential for impact on the overall wilderness quality of the area than in those with only one wilderness. Snake, White, Hot Creek, Garden, Cave, Lake, White River and Railroad are particularly critical, since all have more than 55,000 acres of potential wilderness within 6 mi of a project element.

Implementation of other projects such as the Anaconda Moly Mine near Tonopah, White Pine Power Project (WPPP), Pine Grove Moly project in Pine Valley, Allen Warner project in Dry Lake Valley, Alunite Mine in Wah Wah Valley, and the

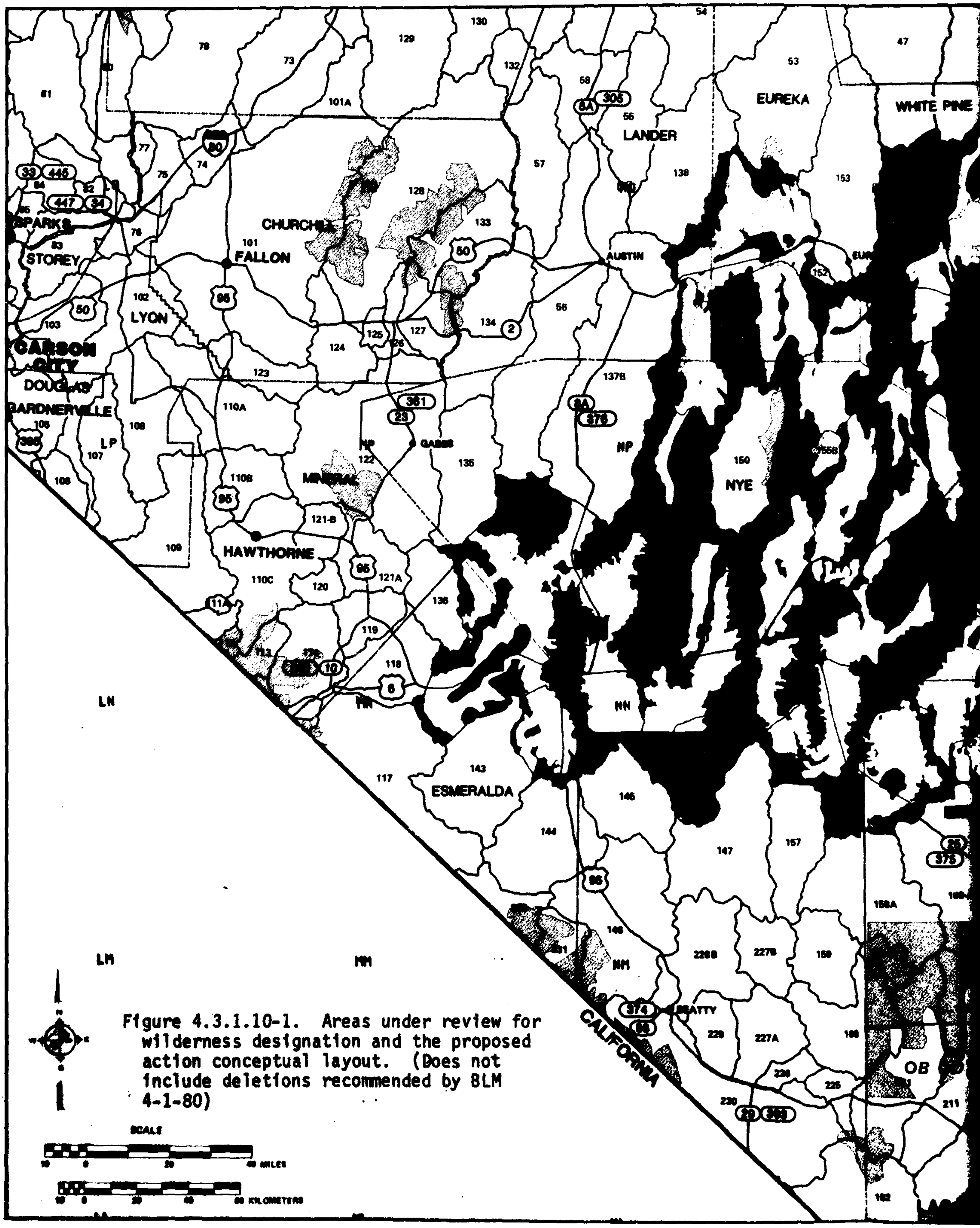
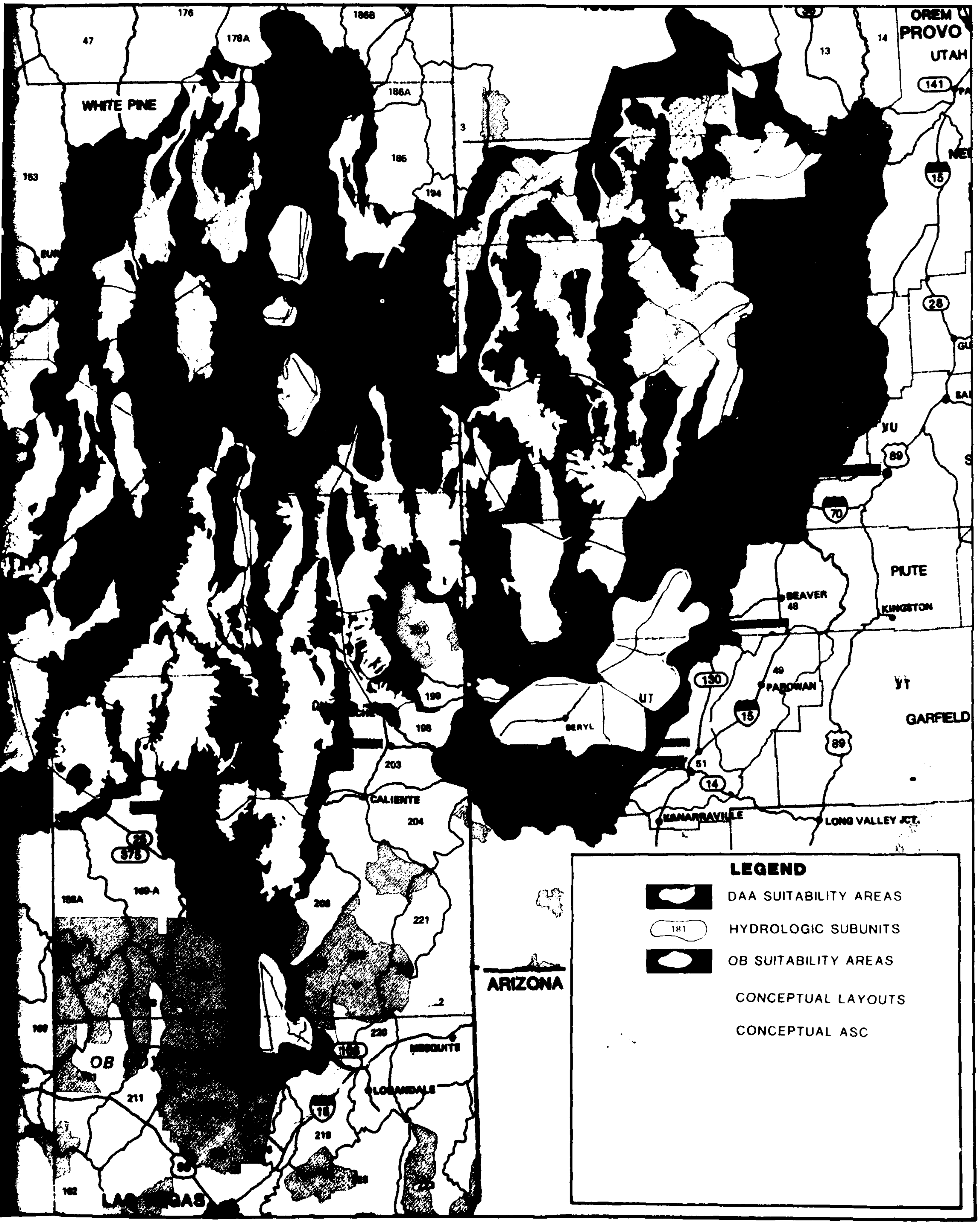


Figure 4.3.1.10-1. Areas under review for wilderness designation and the proposed action conceptual layout. (Does not include deletions recommended by BLM 4-1-80)



LEGEND
DAA SUITABILITY AREAS
HYDROLOGIC SUBUNITS
OB SUITABILITY AREAS
CONCEPTUAL LAYOUTS
CONCEPTUAL ASC
WHITE PINE
OREM
PROVO
UTAH
PIUTE
BEAVER
KINGSTON
PAROWAN
GARFIELD
BERYL
CALIENTE
MESQUITE
LOGANDALE
LONG VALLEY JCT.
ARIZONA

3222-D

Table 4.3.1.10-1. Potential impact to wilderness in Nevada/Utah DDA for the Proposed Action and Alternatives 1-6.

HYDROLOGIC SUBUNIT NO.	HYDROLOGIC SUBUNIT NAME	APPROXIMATE ACRES OF WILDERNESS WITHIN THE SUBUNIT	SHORT-TERM IMPACTS[1] PEOPLE RELATED	SHORT-TERM IMPACTS[1] VISUAL AND NOISE RELATED	LONG-TERM VISUAL IMPACTS[2]
	Subunits with M-X Clusters and DTN				
4	Snake	104,000			
5	Pine	12,000			
6	White	122,000			
7	Fish Springs	48,000			
8	Dugway	—			
9	Government Creek	—			
46	Sevier Desert	34,000			
46A	Sevier Desert & Dry Lake[3]	52,000			
54	Wah Wah	26,000			
137A	Big Smoky-Tonopah Flat	10,000			
139	Kobeh	3,000			
140A	Monitor—Northern	—			
140B	Monitor—Southern	—			
141	Ralston	—			
142	Alkali Spring	—			
148	Cactus Flat	11,000			
149	Stone Cabin[3]	31,000			
151	Antelope	2,000			
154	Newark[3]	—			
155A	Little Smoky—Northern	61,000			
155C	Little Smoky—Southern				
156	Hot Creek	147,000			
170	Penoyer	20,000			
171	Coal	24,000			
172	Garden	91,000			
173A	Railroad—Southern	80,000			
173B	Railroad—Northern	242,000			
174	Jakes	—			
175	Long	—			
178B	Butte—South	9,000			
179	Steptoe	29,000			
180	Cave	75,000			
181	Dry Lake[3]	—			
182	Delamar	23,000			
183	Lake	72,000			
184	Spring	8,000			
196	Hamlin	9,000			
202	Patterson	40,000			
207	White River	77,000			
208	Pahroc	45,000			
209	Pahranagat	142,000			
	Overall DDA Impact				

3844-1

1,2

[1] (No impact.)

[2] (Less than 5,000 acres of wilderness within 6 mi of M-X system.)

[1] (More than 30 acres of wilderness available per potential user during peak year of construction.)

[2] (Value not used.)

[1] (More than 10 but less than 30 acres of wilderness available per potential user during peak year of construction.)

[2] (5,000 to 55,000 acres of wilderness within 6 mi of M-X system.)

[1] (Less than 10 acres of wilderness available per potential user during peak year of construction.)

[2] (More than 55,000 acres of wilderness within 6 mi of M-X system.)

[3] Conceptual location of Area Support Centers (ASCs).

Intermountain Power Project (IPP) near Delta would cause additional land disturbance and population growth. Construction activites for most of these projects would be small compared to that for M-X, and the cumulative effects are expected to be small. IPP is the exception where population increases would be similar to that of M-X during construction of both projects.

The overall consequence of project effects would be a reduction in the wilderness character of the Great Basin. These impacts would be unavoidable if M-X is deployed in the region. Under current law, these direct impacts would not be allowed. All wilderness areas under review are legally protected from such encroachments (Federal Land Policy and Management Act, 1976). An act of Congress would be required in order to construct any program features within wilderness areas.

Mitigation measures to reduce or compensate for significant adverse impacts are limited but include:

- Tier 2 siting decisions to avoid WSAs by a mile or more.

- Air Force cooperation with appropriate managing agency (BLM, USFS, USFWS) in develpment of mitigation.

Coyote Spring Valley OB Impacts

As currently planned, three elements of the proposed Coyote Spring OB would directly impact portions of three designated wilderness study areas (WSAs). Figure 4.3.1.10-2 shows the intersection of the conceptual base with these areas. Conflicts with the DTN segment leading to Delamar Valley, and a secondary potential location for onbase housing would occur with these sitings. Approximately 10 mi^2 of the Delamar Mountain WSA and 22 mi^2 of the Fish and Wildlife WSA are within the proposed OB suitability area. Contiguous with the present suitability area configuration are the southern portion of the Meadow Valley Mountains and the northern portion of the Arrow Canyon Range. The DTN segment would also have the potential to impact parts of WSA #N5-050-0IR-16, an unnamed WSA. As a result of base operations, WSA #NV-050-0215 and 0216 would be expected to experience an indeterminable amount of degradation in wilderness quality. Most of the loss would result from increased noise and visual impacts associated with more urban land uses.

Siting of the OBTS poses a potential impact to the wilderness area adjoining the proposed OB. The OBTS must be located on geotechnically suitable area between the primary OB and the first clusters in the DDA, probably along the DTN leading toward Delamar Valley.

The movement of base features within the area delineated for the potential base could modify impacts to the wilderness areas noted. However, the consequence of project effects on the WSAs could be permanent wilderness loss. This loss represents an irreversible and irretrievable commitment of resources, not replaceable through mitigation measures. The effects of construction activities are unavoidable if the present plan for the Coyote Spring OB is implemented.

An influx of permanent residents to the Coyote Spring area is anticipated with project implementation. The effects of this large human population growth will be largely unavoidable and will vary with the socioeconomic and demographic

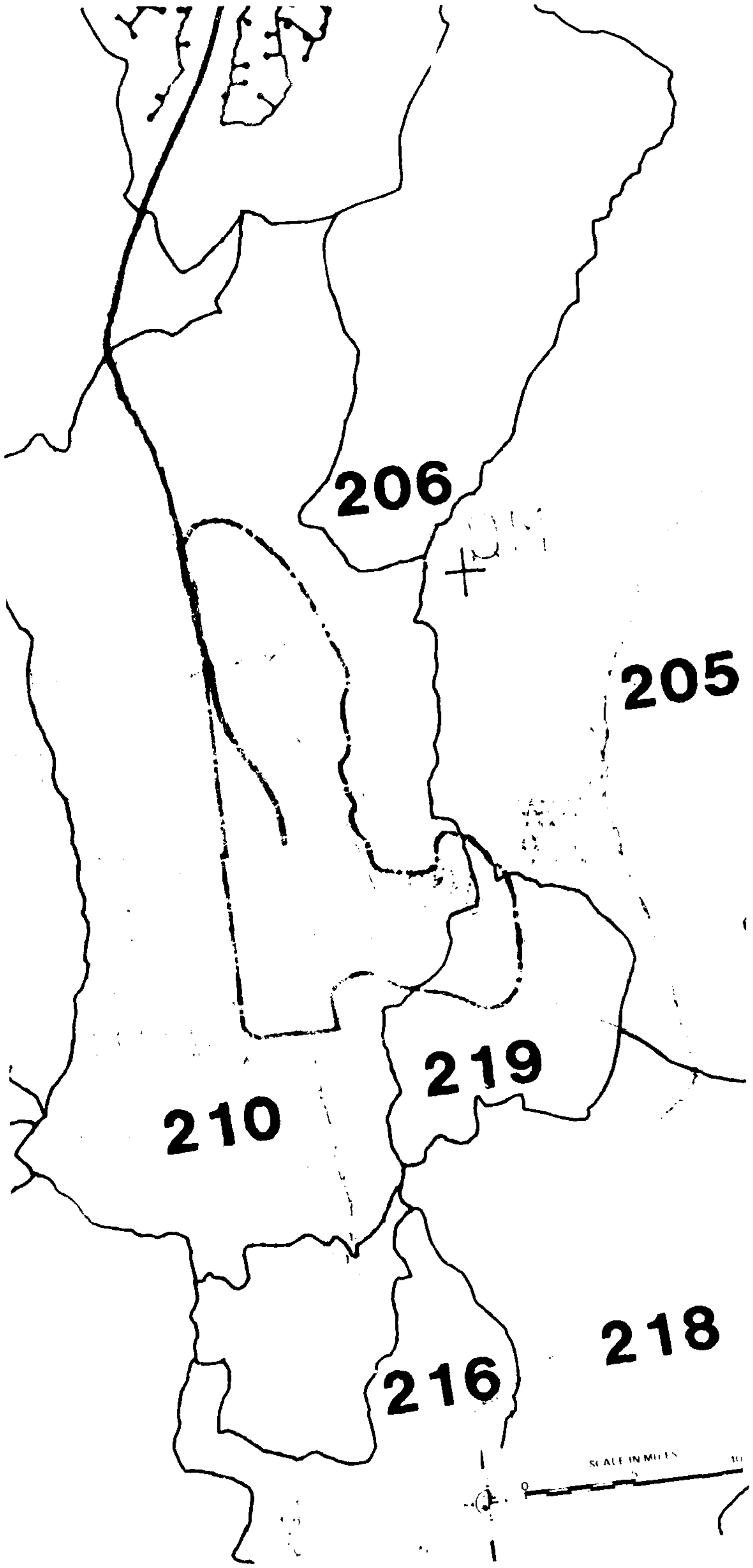


Figure 4.3.1.10-2. Wilderness areas in the vicinity of the Coyote Spring operating

characteristics of the in-migrants. Based on extrapolation from a recreation preference survey of construction and military personnel at SAC air base at Mountain Home, Idaho (Haagen, 1980), wilderness resources in the area could receive up to 1,600 additional visitors. If predicted use appears to impair the wilderness quality of an area, management effort to regulate visitor use could be undertaken. The precise extent to which increased use will impact a particular wilderness is difficult to determine.

Table 4.3.1.10-2 summarizes wilderness abundance and level of population-related effects on a hydrologic subunit basis with Coyote Spring as Operating Base I for the Proposed Action. Subunits with a high potential impact include Pahrangat Delamar, and Beryl Enterprise. Sixteen additional subunits would be particularly attractive for wilderness visitation. Areas outside the DDA anticipated to receive increased visitation by merit of their popular wilderness areas include the southern portion of Beryl-Enterprise for Pine Valley Mountain, and the Colorado River drainage for Zion National Park, Cedar Breaks and Bryce Canyon National Monuments as well as RARE II wilderness recommendation Ashdown Gorge.

There are no wilderness areas in the immediate vicinity of the Milford OB site. The closest wilderness study area is the recommended Wah Wah Mountains WSA approximately 30 mi north-northwest of the site. Effects on wilderness resources from anticipated population growth will be unavoidable so long as a base is sited in this area. Vicinity wilderness areas could receive up to 1,300 additional visitors. Hydrologic subunits with high potential impact levels include: Snake, Pine, White, Wah Wah, Cave, Lake, and Hamlin (Table 4.3.1.10-2). Additional hydrologic subunits outside the DDA anticipated to receive increased numbers of visitation from M-X-related personnel are the same as those for Coyote Spring.

ALTERNATIVE 1 (4.3.1.10-3)

The DDA, first OB, and associated impacts would be the same as for the Proposed Action. The second OB would be located at Beryl, Utah. The closest wilderness is the RARE II recommended Pine Valley Mountain region approximately 25 mi south-southeast of the base site.

Impacts of an OB in this area would stem from the indirect effects of the movements and recreational activities of an estimated 12,800 additional permanent residents in the Beryl region. The key hydrologic subunits most likely to experience increased wilderness visitation include the Snake, Cave, Lake, Hamlin and Patterson. Table 4.3.1.10-2 summarizes wilderness abundance and level of population related impacts.

ALTERNATIVE 2 (4.3.1.10-4)

The DDA, first OB, and associated impacts would be the same as for the Proposed Action. The second OB would be located near Delta, Utah. There are no wilderness areas intersecting the OB suitability zone. The nearest WSA is the recommended Swasey Mountains, approximately 10 mi northwest of the OB site. Additional areas nearby include designated Howell and Notch Peak WSAs located 10 and 16 mi, respectively, to the west of the proposed site.

An estimated 13,700 permanent residents in the Delta area would be expected. Increased wilderness use and associated impacts particularly in nearby popular

Table 4.3.1.10-2. Potential population-related impacts to wilderness around operating bases for the Proposed Action and Alternatives 1-8. (page 1 of 2)

HYDROLOGIC SUBUNIT OR COUNTY		APPROXIMATE ACRES OF WILDERNESS WITHIN THE SUBUNIT	LONG-TERM POPULATION-RELATED POTENTIAL IMPACT[1]		
NO.	NAME		BERYL, UTAH OB (ALT. 1,3,4)	COYOTE SPRING VALLEY NEVADA OB (P.A. & ALT. 1,2,4,6,8)	DELTA, UTAH OB (ALT. 2)
	Subunits or Counties within OB Suitability Area				
46	Sevier Desert	34,000			High
46A	Sevier Desert-Dry Lake[2,4]	52,000			High
50	Milford[4]	—			
52	Lund District	—	No		
53	Beryl-Enterprise	2,000	High		
179	Steptoe	29,000			
210	Coyote Springs	433,000		High	
219	Muddy River Springs	88,000		High	
	Curry County, NM	—			
	Hartley County, TX[3]	—			
	Other Affected Subunits or Counties				
4	Snake	104,000	High	Moderate	High
5	Pine	12,000	Moderate	Low	Moderate
6	White	122,000	Moderate	Moderate	High
7	Fish Springs	48,000	Low	Low	High
8	Dugway	—	No	No	No
9	Government Creek	—	No	No	No
46	Sevier Desert	34,000	Low	Low	see above
46A	Sevier Desert-Dry Lake[2,4]	52,000	Moderate	Low	see above
50	Milford[4]	—	No	No	No
52	Lund District	—	see above	No	No
53	Beryl-Enterprise	2,000	see above	High	Moderate
54	Wah Wah	26,000	Moderate	Low	Low
137A	Big Smoky-Tonopah Flat	10,000	Moderate	Moderate	Moderate
139	Kobeh	3,000	Low	Low	Low
140A	Monitor—Northern	—	No	No	No
140B	Monitor—Southern	—	No	No	No
141	Ralston	—	No	No	No
142	Alkali Spring	—	No	No	No
148	Cactus Flat	11,000	Low	Low	Low
149	Stone Cabin[2]	31,000	Moderate	Moderate	Low
151	Antelope	2,000	Low	Low	Low
154	Newark[2]	—	No	No	No
155A	Little Smoky—Northern	61,000	Low	Low	Low
155C	Little Smoky—Southern	see North	Low	Low	Low
156	Hot Creek	147,000	Moderate	Moderate	Moderate
170	Penoyer	20,000	Moderate	Moderate	Moderate
171	Coal	24,000	Moderate	Moderate	Low
172	Garden	91,000	Moderate	Moderate	Moderate
173A	Railroad—Southern	80,000	Moderate	Moderate	Low
173B	Railroad—Northern	242,000	Moderate	Moderate	Moderate
174	Jakes[2]	—	No	No	No
175	Long	—	No	No	No
178	Butte	9,000	Low	Low	Low
179	Steptoe	29,000	Moderate	Moderate	Moderate
180	Cave	75,000	High	Moderate	Moderate
181	Dry Lake[2,4]	—	No	No	No
182	Delamar	23,000	Moderate	High	Low
183	Lake	72,000	High	Moderate	Moderate
184	Spring	8,000	Moderate	Low	Low
196	Hamlin	9,000	High	Moderate	Moderate
202	Patterson	40,000	High	Moderate	Moderate
207	White River	77,000	Moderate	Moderate	Moderate
208	Pahroc	45,000	Moderate	Moderate	Low
209	Pahranagat	142,000	Moderate	High	Low
210	Coyote Springs	433,000	Moderate	see above	Low
219	Muddy River Springs	88,000	Moderate	see above	Low
	Chaves County, NM	Salt Creek and Mescalero Sands			
	Overall Impact for OB		Moderate	Moderate	Low

3849-2

[1]

- No potential impact.
- Low potential impact.
- Moderate potential impact.
- High potential impact.

[1]A population-related indirect effect index for OB impact analysis was developed using linear distance from the population center and attractiveness of a particular wilderness site. A detailed discussion of the methodology is contained in ETR 30

[2]Conceptual location of Area Support Centers (ASCs) for Proposed Action and Alternatives 1-6.

[3]Conceptual location of Area Support Centers (ASCs) for Alternative 7.

[4]Conceptual location of Area Support Centers (ASCs) for Alternative 8.

Table 4.3.1.10-2. Potential population-related impacts to wilderness around operating bases for the Proposed Action and Alternatives 1-8. (page 2 of 2)

HYDROLOGIC SUBUNIT OR COUNTY		APPROXIMATE ACRES OF WILDERNESS WITHIN THE SUBUNIT	LONG-TERM POPULATION-RELATED POTENTIAL IMPACT[1]			
NO	NAME		ELY, NEVADA OB (ALT. 3,5)	MILFORD, UTAH OB (P.A & ALT. 3,5,6	CLOVIS, NEW MEXICO OB (ALT 7,8)	DALHART, TEXAS OB (ALT. 7)
	Subunits or Counties within OB Suitability Area					
46	Sevier Desert	34,000				
46A	Sevier Desert-Dry Lake[2,4]	52,000		No potential impact		
50	Milford[4]	—		No potential impact		
52	Lund District	—				
53	Beryl-Enterprise	2,000				
179	Steptoe	29,000	High potential impact			
210	Coyote Springs	433,000				
219	Muddy River Springs	88,000				
	Curry County, NM	—			No potential impact	
	Hartley County, TX[3]	—				No potential impact
	Other Affected Subunits or Counties					
4	Snake	104,000	High	High		
5	Pine	12,000	Moderate	High		
6	White	122,000	High	High		
7	Fish Springs	48,000	Moderate	Moderate		
8	Dugway	—	No	No		
9	Government Creek	—	No	No		
46	Sevier Desert	34,000	Moderate	Moderate		
46A	Sevier Desert-Dry Lake[2,4]	52,000	Moderate	Moderate		
50	Milford[4]	—	No	No		
52	Lund District	—	No	No		
53	Beryl-Enterprise	2,000	Moderate	Low		
54	Wah Wah	26,000	Moderate	High		
137A	Big Smoky-Tonopah Flat	10,000	Moderate	Moderate		
139	Kobeh	3,000	Moderate	Low		
140A	Monitor—Northern	—	No	No		
140B	Monitor—Southern	—	No	No		
141	Ralston	—	No	No		
142	Alkali Spring	—	No	No		
148	Cactus Flat	11,000	Low	Low		
149	Stone Cabin[2]	31,000	Moderate	Moderate		
151	Antelope	2,000	Moderate	Low		
154	Newark[2]	—	No	No		
155A	Little Smoky—Northern	61,000	Moderate	Moderate		
155C	Little Smoky—Southern	see North	Moderate	Low		
156	Hot Creek	147,000	High	Moderate		
170	Penoyer	20,000	Moderate	Moderate		
171	Coal	24,000	Moderate	Low		
172	Garden	91,000	Moderate	Moderate		
173A	Railroad—Southern	80,000	Moderate	Moderate		
173B	Railroad—Northern	242,000	High	Moderate		
174	Jakes	—	No	No		
175	Long	—	No	No		
178	Butte—South	9,000	Moderate	Low		
179	Steptoe	29,000	see above	Moderate		
180	Cave	75,000	High	High		
181	Dry Lake[2,4]	—	No	No		
182	Delamar	23,000	Low	Low		
183	Lake	72,000	High	High		
184	Spring	8,000	Moderate	Moderate		
196	Hamlin	9,000	High	High		
202	Patterson	40,000	Moderate	Moderate		
207	White River	77,000	High	Moderate		
208	Pahroc	45,000	Moderate	Low		
209	Pahranagat	142,000	Low	Low		
210	Coyote Springs	433,000	Low	Low		
219	Muddy River Springs	88,000	Low	Low		
	Chaves County, NM	Salt Creek and Mescalero Sands	No	No	No	No
	Overall Impact for OB		Moderate	Moderate	No	No

3849-2

No potential impact.

Low potential impact.

Moderate potential impact.

High potential impact.

[1] A population-related indirect effect index for OB impact analysis was developed using linear distance from the population center and attractiveness of a particular wilderness site. A detailed discussion of the methodology is contained in ETR 30.

[2] Conceptual location of Area Support Centers (ASCs) for Proposed Action and Alternatives 1-6

[3] Conceptual location of Area Support Centers (ASCs) for Alternative 7

[4] Conceptual location of Area Support Centers (ASCs) for Alternative 8

wilderness areas will be largely unavoidable. Hydrologic subunits receiving increased wilderness use would include Snake, White, Fish Springs, and Sevier Desert and Sevier Desert/Dry Lake. Table 4.3.1.10-2 summarizes wilderness abundance and level of population-related impacts.

ALTERNATIVE 3 (4.3.1.10.5)

The DDA and associated impacts would be the same as for the proposed action. Using Beryl as the first OB location for Alternative 3 would result in an increase of 16,900 long-term residents in the area, approximately 30 percent more than for Alternative 1 with Beryl as a second OB. Although these figures differ, there would be no substantial change in the potential population-related effects of an OB location at Beryl.

The second OB would be located near Ely. There are no potential wilderness areas within the OB suitability zone. The nearest wilderness areas are the designated WSAs, South Egan Range and Mt. Grafton WSAs located 18 and 20 mi south-southwest and south, respectively. Impacts to wilderness would stem from the recreational activities of an estimated 14,000 additional permanent residents in the region. High impacts are predicted for Snake, White, Hot Creek, Railroad northern, Steptoe, Cave, Lake, Hamlin, and White River. Table 4.3.1.10-2 summarizes wilderness abundance and level of population-related impacts.

ALTERNATIVE 4 (4.3.1.10.6)

The DDA and associated impacts would be the same as for the Proposed Action. Impacts for the first OB at Beryl are the same as those for Alternative 3.

Impacts for the proposed OB location at Coyote Spring are discussed under the Proposed Action. Use of the Coyote Spring site for a second base would reduce the growth of permanent residents by about 24 percent. This would have the potential to reduce the indirect population-related effects of an OB location in this region. Table 4.3.1.10-2 summarizes wilderness abundance and level of population-related impacts.

ALTERNATIVE 5 (4.3.1.10.7)

The DDA and associated impacts would be the same as for the Proposed Action. Impacts for the proposed OB location at Milford are discussed under the Proposed Action. Using Milford as the first OB would result in about 30 percent more permanent residents over that projected for Milford as a second OB but no substantial changes in effects on wilderness areas (Table 4.3.1.10-2). Impacts for the proposed Ely OB are the same as for Alternative 3.

ALTERNATIVE 6 (4.3.1.10.8)

The DDA and associated impacts would be the same as for the proposed action. Impacts for a first OB at Milford and a second OB at Coyote Spring are the same as those for Alternatives 5 and 4, respectively. Table 4.3.1.10-2 summarizes wilderness abundance and level of population-related impacts for Alternative 6.

ALTERNATIVE 7 (4.3.1.10.9)

DDA Impacts

There are three wilderness areas in the Texas/New Mexico study region, Salt Creek Wilderness Area, and the Sabinosa and Mescalero Sands Desiganted Wilderness Study Areas. Of these, the first two are located well outside the DDA, and thus will not be impacted by project-related activity. However, Mescalero Sands, in southern Chaves County, New Mexico, is surrounded by clusters.

Construction impacts would be comparable to those discussed for the Proposed Action, except the low physical relief of the Texas/New Mexico area would limit visual impacts from construction activities to a minimal distance inside the WSA. Construction noise impacts could still be significant. Table 4.3.1.10-3 summarizes potential impacts to wilderness for Alternative 7.

OB Impacts

The first OB site at Clovis is over 200 mi by road from Mescalero Sands, and no significant direct or indirect effects are expected. The second OB located near Dalhart would be even further away and no significant impacts would be anticipated.

ALTERNATIVE 8 (4.3.1.10.10)

Figures 4.3.1.10-3 and 4.3.1.10-4 show the relationship of wilderness to project elements for the Nevada/Utah and Texas/New Mexico portions, respectively, of the split basing alternative. Deploying half the project in Nevada/Utah would reduce by about 40 percent the number of hydrologic subunits containing project elements and having high potential for impact to wilderness (Table 4.3.2.9.1-4). In Texas/New Mexico, the overall project area is also reduced by about half, but the proximity to wilderness is the same as full basing.

Split basing would differ from the Proposed Action and Alternative 7 in terms of visual aesthetics, noise levels, air quality, and in population growth. The potential for combined effects of M-X and other projects planned for the Nevada/Utah study area would be reduced since the Anaconda Molybdenum project and most of the potential site for the White Pine Power Project would be outside the deployment area. Interactions with Alunite, Pine Grove Molybdenum, IPP and Allen Warner could still occur. No significant projects are known to be planned for the Texas/New Mexico area.

Table 4.3.1.10-4 summarizes the estimated DDA impact on the wilderness resource for each hydrologic subunit in which project elements would be displayed for split basing. In Nevada and Utah, significant impacts to wilderness are predicted for 5 of the 22 hydrologic subunits containing project elements (rather than 41 hydrologic subunits with project elements under the Proposed Action). Long-term effects are the same as those for Proposed Action. In Texas and New Mexico, both direct and indirect effects for this alternative would be the same as those described for Alternative 7 and are not significant except for impacts at Mescalero Sands WSA mentioned above.

Mitigation measures that would reduce significant impacts resulting from project implementation are the same as those listed for the Proposed Action and Alternative 7.

Table 4.3.1.10-3. Potential impact to wilderness in Texas/New Mexico around operating bases for Alternative 7.

COUNTY	WILDERNESS AREA	SHORT-TERM IMPACTS[1]	LONG-TERM IMPACTS[1]
Counties with OB Suitability Area			
Bailey, TX	—		
Castro, TX	—		
Cochran, TX	—		
Dallam, TX	—		
Deaf Smith, TX[2]	—		
Hartley, TX[2]	—		
Hockley, TX	—		
Lamb, TX	—		
Oldham, TX	—		
Parmer, TX	—		
Randall, TX	—		
Sherman, TX	—		
Swisher, TX	—		
Chaves, NM	Salt Creek and Mescalero Sands		
Curry, NM	—		
DeBaca, NM	—		
Guadalupe, NM	—		
Harding, NM	—		
Lea, NM	—		
Quay, NM	—		
Roosevelt, NM[2]	—		
Union, NM	—		
Overall Impact			

3850-2

[1]

No potential impact.

Low potential impact.

Moderate potential impact.

High potential impact.

[2]Conceptual location of Area Support Centers (ASCs).

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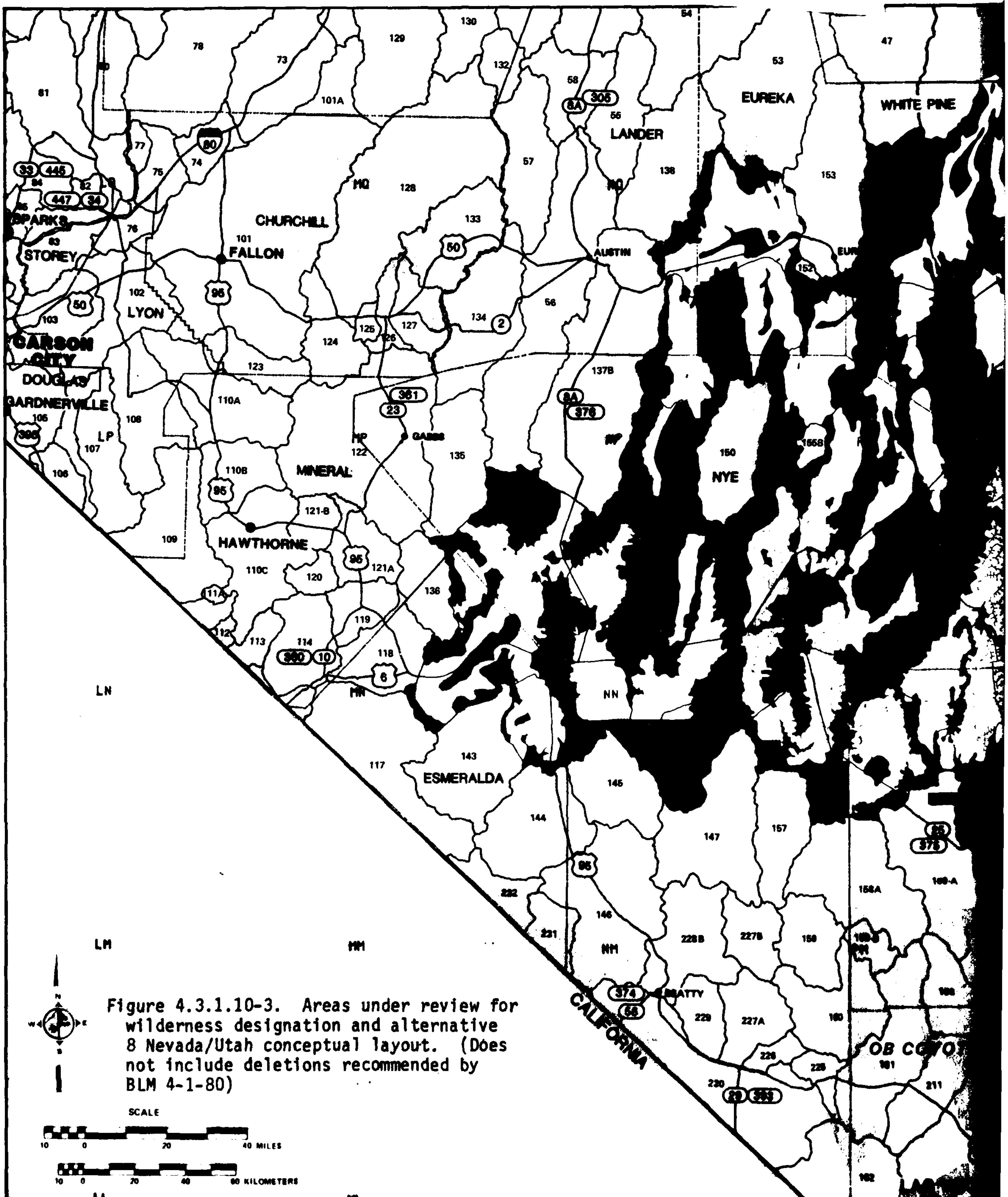
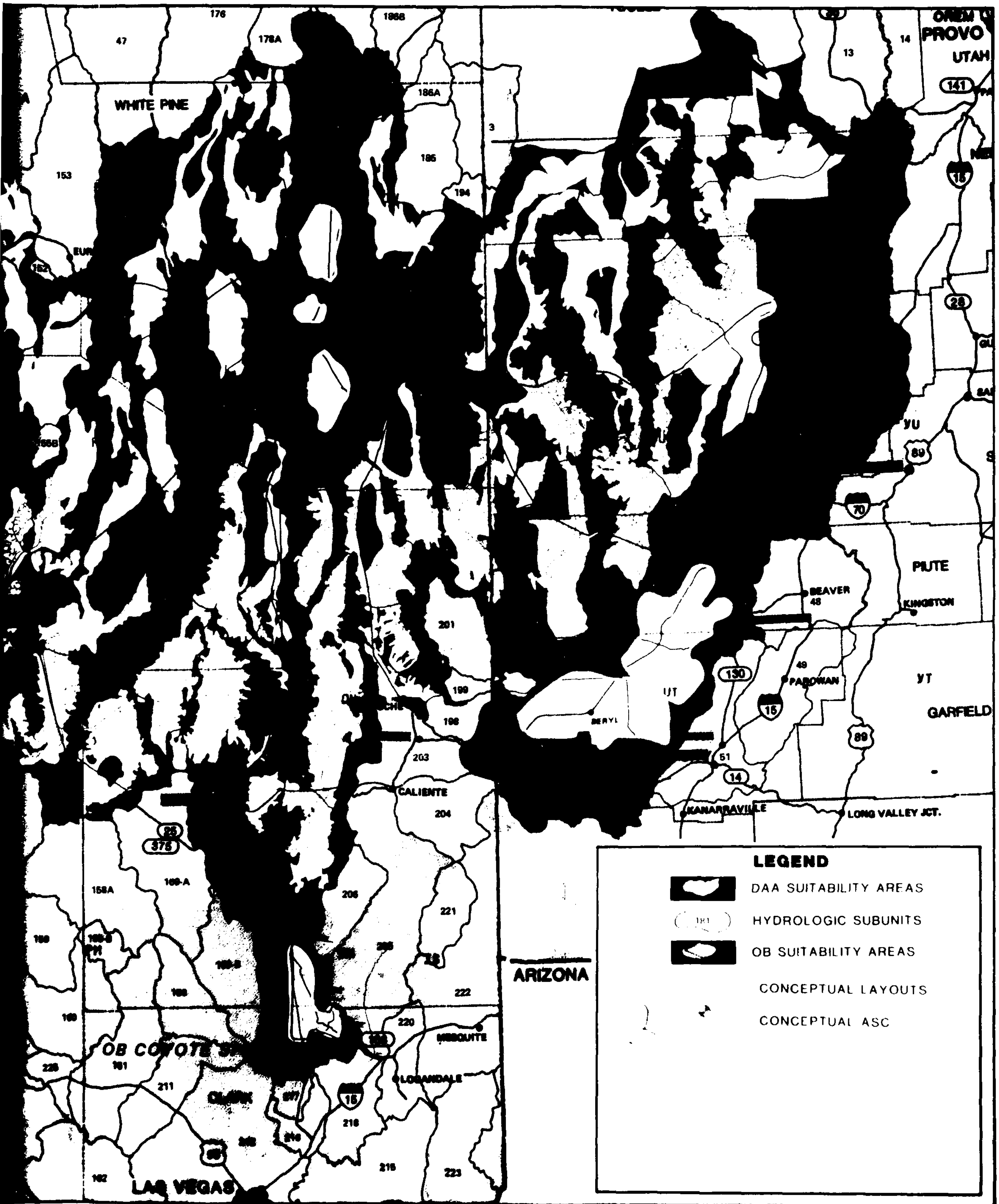


Figure 4.3.1.10-3. Areas under review for wilderness designation and alternative 8 Nevada/Utah conceptual layout. (Does not include deletions recommended by BLM 4-1-80)



WHITE PINE
PROVO
UTAH
PIUTE
BEAVER
KINGSTON
PAROWAN
GARFIELD
BERYL
CALIENTE
KANARRAVILLE
LONG VALLEY JCT.
ARIZONA
OB COYOTE SP
CLARK
MESQUITE
LOGANDALE
LAS VEGAS
LEGEND
DAA SUITABILITY AREAS
HYDROLOGIC SUBUNITS
OB SUITABILITY AREAS
CONCEPTUAL LAYOUTS
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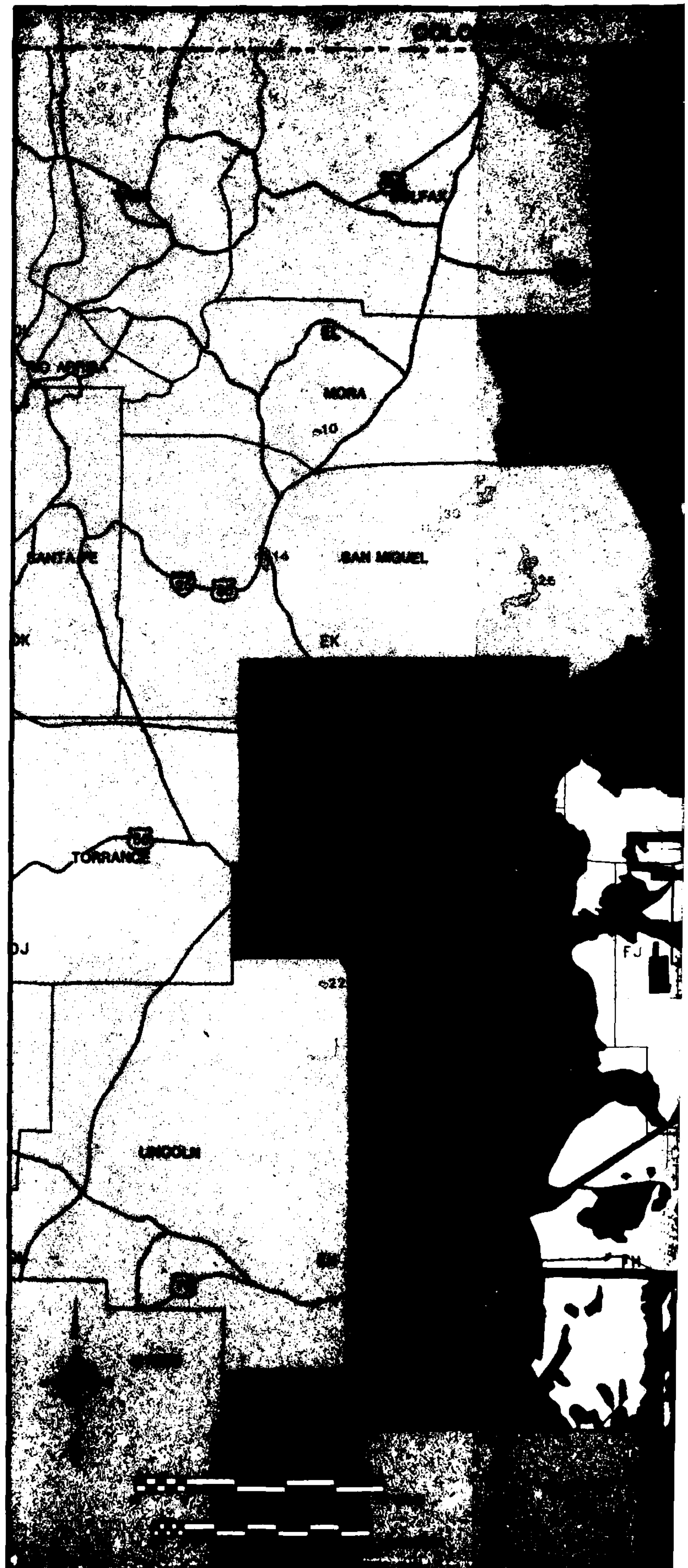

Figure 4.3.1.10-4. Relationship between wilderness areas and Alternative 8 project activities, Texas/New Mexico.

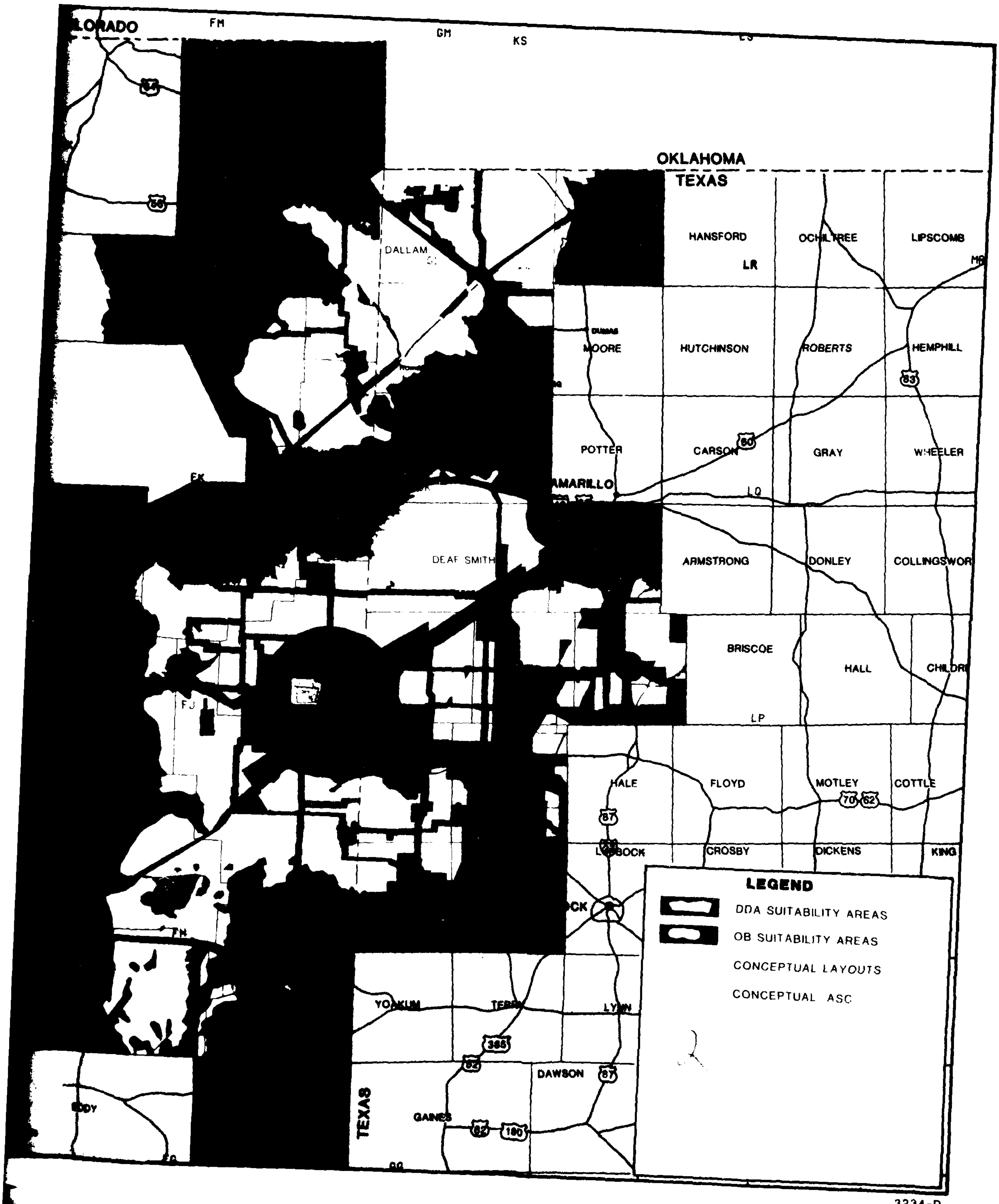
OKLAHOMA
TEXAS
DALLAM
HANSFORD
OCHILTREE
LIPSCOMB
MOORE
HUTCHINSON
ROBERTS
HEMPHILL
POTTER
CARSON
GRAY
WHEELER
AMARILLO
DEAF SMITH
ARMSTRONG
DONLEY
COLLINGSWOR
BRISCOE
HALL
HALE
FLOYD
MOTLEY
COTTLE
CROSBY
DICKENS
KING
YOAKUM
DAWSON
GAINES
EDDY
TEXAS
LEGEND
DDA SUITABILITY AREAS
OB SUITABILITY AREAS
CONCEPTUAL LAYOUTS
CONCEPTUAL ASC
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Table 4.3.1.10-4. Potential impact to wilderness in Nevada/Utah and Texas/New Mexico DDAs for Alternative 8.

HYDROLOGIC SUBUNIT OR COUNTY NO.	HYDROLOGIC SUBUNIT OR COUNTY NAME	APPROXIMATE ACRES OF WILDERNESS WITHIN THE SUBUNIT	SHORT-TERM IMPACTS[1] PEOPLE RELATED	SHORT-TERM IMPACTS[1] VISUAL AND NOISE RELATED	LONG-TERM VISUAL IMPACTS[2]
	Subunits or Counties with M-X Clusters and DTN				
4	Snake	104,000			
5	Pine	12,000			
6	White	122,000			
7	Fish Springs	48,000			
46	Sevier Desert	34,000			
46A	Sevier Desert & Dry Lake[3]	52,000			
54	Wah Wah	26,000			
155	Little Smoky	10,000			
156	Hot Creek	147,000			
170	Penover	20,000			
171	Coal	24,000			
172	Garden	91,000			
173A	Railroad—Southern	80,000			
173B	Railroad—Northern	242,000			
180	Cave	75,000			
181	Dry Lake[3]	—			
182	Delamar	23,000			
183	Lake	72,000			
184	Spring	8,000			
196	Hamlin	9,000			
202	Patterson	40,000			
207	White River	77,000			
	Bailey, TX	—			
	Cochran, TX	—			
	Dallam, TX	—			
	Deaf Smith, TX	—			
	Hartley, TX[3]	—			
	Hockley, TX	—			
	Lamb, TX	—			
	Oldham, TX	—			
	Parmer, TX				
	Chaves, NM	Salt Creek Wilderness & Mescalero Sands			
	Curry, NM	—			
	DeBaca, NM	—			
	Guadalupe, NM	—			
	Harding, NM	—			
	Lea, NM	—			
	Quay, NM	—			
	Roosevelt, NM[3]	—			
	Union, NM	—			
	Other Affected Subunits				
208	Pahroc	45,000			
209	Pahranagat	142,000			
	Overall Impact	Nevada/Utah			
		Texas/New Mexico			

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[1](No impact.)
[2](Less than 5,000 acres of wilderness within 6 mi of M-X system.)

[1](More than 30 acres of wilderness available per potential user during peak year of construction.)
[2](Value not used.)

[1](More than 10 but less than 30 acres of wilderness available per potential user during peak year of construction.)
[2](5,000 to 55,000 acres of wilderness within 6 mi of M-X system.)

[1](Less than 10 acres of wilderness available per potential user during peak year of construction.)
[2](More than 55,000 acres of wilderness within 6 mi of M-X system.)

[3]Conceptual location of Area Support Centers (ASCs).

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